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TRANSACTIONS & STUDIES

*of the*

College of Physicians of Philadelphia

Volume 9 (Fourth Series)

Number 1 (April 1941)

# Studies in Ulcerative Colitis*

*By* Thomas T. Mackie, M.D.

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CHRONIC ulcerative colitis may be defined as a cyclic recurrent inflammatory disease of the colon characterized by successive phases of activity and quiescence which may and frequently do recur irrespective of treatment. The acute phases are accompanied by varied physiologic disturbances and a productive type of inflammation which leads to progressive fibrosis of the colon with consequent permanent anatomic and physiologic changes.

The successful therapeutic management of any disease postulates certain definite premises. The primary etiology must be proven. The anatomic and physiologic effects must be recognized and evaluated. Means for control of the primary mechanism must be developed, and the associated secondary changes must be compensated. Chronic ulcerative colitis has been the subject of much investigation. The varied philosophies concerning etiology, and the varied regimes from time to time advocated in therapy lead inescapably to two conclusions. The mechanism of the disease has not been established. Current methods of treatment have proven unsatisfactory.

### SEROLOGICAL AND BACTERIOLOGICAL STUDIES

For the most part, attention has been directed to the factor of infection. The disease is commonly regarded as a local inflammatory process limited to the wall of the colon, the response to bacterial invasion of this portion of the gastrointestinal tract. Considerable impetus was given to this concept following the last war when it became evident that a chronic inflammatory type of colitis was a not infrequent sequel to bacillary dysentery (1). Similarities in the pathology of chronic bacillary dysentery and so-called idiopathic ulcerative colitis lent support to the concept, as did the occasional recovery of various types of *Shigella dysenteriae* from scattered cases by numerous observers. The demon-

* Mary Scott Newbold Lecture XLIX, The College of Physicians of Philadelphia, February 5, 1941.

stration of agglutinins for these organisms in the sera of certain patients seemed to lend added support and led one observer to the concept that chronic enteritis and chronic ulcerative colitis both resulted from an occult bacillary dysentery (2). In similar fashion demonstration of the presence of anti-dysentery bacteriophage in the stools of many patients suffering from chronic ulcerative colitis (3, 4) was considered "to have some significance" and led to the conclusion that "The finding of a bacteriophage active for one or more strains of bacillary dysentery organisms, is indirect but suggestive evidence that the patients have had or are suffering from bacillary dysentery."

More important historically, however, is the diplo-streptococcus (5) which has been recovered in a high percentage of cases by culture direct from the inflamed mucosa and which has been demonstrated in sections of the inflamed wall of the colon. It was described as a specific organism, the etiologic agent of chronic ulcerative colitis. The specificity, however, has been denied. Strains said to be identical and conforming to type have been shown to differ among themselves in their behavior in culture and in heat resistance. The serologic characteristics are not uniform and close immunologic relationship to Enterococcus, a ubiquitous intestinal organism, has been clearly proven (6). The concept that it is the primary invader and the etiologic agent of the disease has not been widely accepted.

Subsequently, an anaerobic organism, *Bacterium necrophorum*, was recovered from certain cases of ulcerative colitis and suggested as the causative factor. This also has not been accepted. In similar fashion, at one time or another and by various investigators most of the bacteria recoverable from the human colon have been suggested as etiologic agents. Too often simple association has been misconstrued to indicate a cause and effect relationship. The evidence therefore supporting a specific infectious agent is both contradictory and unconfirmed at the present time.

Although the disease has almost universally been regarded as the expression of infection of the colonic wall, other mechanisms have had their proponents. Food allergy has been shown to play an important role in certain cases (7). Psychogenic factors operating through the vegetative nervous system to produce hyperperistalsis and surface digestion of the mucosa have been held responsible (8). The demonstration that persistent spasm of the musculature of externalized portions of the colon of experimental animals leads progressively to congestion of the mucosa, bleeding, and finally ulceration (9) indicates that the autonomic nervous system unquestionably plays an important role. This is further supported by clinical evidence to which reference will be made subsequently. None of these hypotheses, however, explain the clinical course of the disease, nor do they provide the therapeutic indications which permit of checking the acute attack and of preventing recurrence.

Our own studies of chronic ulcerative colitis began in 1931 with a series of investigations into the role of the *Shigella dysenteriae* as the infectious agent. Continued observations of an increasing number of cases over lengthening periods of time yielded clinical data which in turn stimulated investigation into certain aspects of the physiology of the intestinal tract, deficiency states and the role of the various vitamins, gastro-intestinal allergy, the usefulness of and indications

for drug therapy, and the natural history of the disease. This group now comprises a total of two hundred cases whom it has been possible to investigate adequately, and who have been followed for periods ranging from a few months to nine years. Much of these data has already been reported. Some is still in process of preparation. Taken together these various studies constitute the basis of a philosophy of the disease which we believe explains most if not all of the observed phenomena and which has proven useful in clinical management.

The initial studies of the role of the *Shigella dysenteriae* were carried out in a group of eighty-three consecutive cases of chronic ulcerative colitis, and a group of one-hundred and three control subjects presenting a variety of conditions (10). Positive cultures were obtained from seventeen of the colitis cases; eighteen others were found to have serum agglutinins in titers considered to be significant. Both the serologic and the cultural evidence incriminated members of the Flexner, or mannite-fermenting, and Sonne-Duval groups of the dysentery bacilli. Positive cultures were obtained from two members of the control group, and seven others yielded positive agglutination reactions. This evidence we did not consider sufficient to warrant a statement stronger than that "a certain number of these patients present positive evidence of chronic infection by *B. dysenteriae*, a group known to be pathogenic for man."

Efforts to evaluate the therapeutic efficacy of anti-dysentery bacteriophage in the culture-positive cases led to the next phase of the investigation. Although it early became apparent that bacteriophage had little if any usefulness in treatment, study of the phage content of stools was continued in parallel with the bacteriologic and serologic investigation. It has long been known that bacteriophages, isolated in nature, possess a mosaic of lytic activities, and that each may be active against an apparently fortuitous range of bacterial species (11). Moreover, it has been observed in India that a lytic principle active against *S. dysenteriae* frequently can be isolated from individuals who are not the subjects of dysentery (12). On theoretical grounds, therefore, it seemed improbable that the term "diagnostic bacteriophage" was either valid or defensible. We were able to isolate such a principle from the stools of only twenty-nine per cent of cases presenting cultural or serologic evidence of infection by these organisms. Conversely, anti-dysentery bacteriophage was obtained from twelve per cent of a group of miscellaneous controls none of whom yielded evidence of infection by the dysentery bacilli. The conclusion was inescapable, therefore, that the presence of a lytic principle in the stool has little or no diagnostic significance when unsupported by corollary evidence in the form of positive culture or significant agglutinin titer.

In the course of these studies our attention was early attracted to discrepancies between the results of agglutination reactions and repeated cultures from the mucous membrane of the rectum and rectosigmoid. It was recognized at the outset that this method of serologic diagnosis had definite limitations. Healthy individuals have been shown to possess normal agglutinins for *S. dysenteriae* (13) and the titer may reach 1/150 for the Flexner strains. Formalized antigens, however, have been found to give fewer non-specific reactions. With such antigens titers of 1/40 for the Shiga bacilli, 1/150 for the Flexner, and 1/25 for the Sonne-Duval bacilli, have been considered diagnostic (14).

Repeated investigations of thirteen

cases of chronic ulcerative colitis from whom *S. dysenteriae* were recovered showed that high serum titers do not regularly accompany chronic infection by these organisms (15). In the course of a heavy, long-continued Flexner infection the patient's serum may present the same agglutinin titer for Shiga, Flexner, and Sonne, or the Sonne bacilli may be agglutinated to higher titer. Furthermore, the titer of homologous agglutinins may remain fairly constant, or it may show marked fluctuation, often falling temporarily to zero. Moreover, the height of the titer does not appear to be a function either of the duration or the intensity of the infection as measured by the recovery rate in culture.

A striking finding was the predominance of higher serum titers among thirty-four cases of ulcerative colitis from whom we were repeatedly unable to isolate *S. dysenteriae*. Not even the most heavily infected patients possessed agglutinins at the levels frequently found in the culture-negative group. In these, likewise, marked and irregular fluctuations of titer were observed. Frequently there was complete lack of parallelism between the individual agglutinin curves for Shiga, Flexner, and Sonne bacilli in the same patient.

These observations strongly suggested that agglutinins for *S. dysenteriae* may develop in response to non-specific heterologous stimuli. It is well known that immunization of an animal against *E. typhi* often produces homologous major agglutinins, and heterologous minor agglutinins for *E. coli*. Agglutinins for *S. dysenteriae*, previously absent, have been observed to appear in the serum of certain cases of chronic ulcerative colitis in the course of immunization by *E. coli* toxin and vaccine mixtures (17). It is not unusual in bacillary dysentery to recover *E. coli* which agglutinate in Flexner anti-serum (18).

We isolated thirteen strains of *E. coli* from twelve cases of chronic ulcerative colitis whose sera agglutinated the Flexner or Sonne-Duval strains of *S. dysenteriae* but who were repeatedly negative on culture. All thirteen strains agglutinated to varying titer in monovalent anti-dysentery sera. Absorption of these sera by the homologous antigens removed both the homologous dysentery and the heterologous coli agglutinins. Conversely, absorption by the *E. coli* removed the heterologous coli agglutinins and significantly reduced the homologous dysentery agglutinins. Similar studies using monovalent anti-coli sera yielded confirmatory data.

These findings, therefore, indicate that the agglutination reaction, unsupported by confirmatory bacteriologic evidence, does not constitute valid proof of infection. The diagnosis of bacillary dysentery can be substantiated only by recovery of the organism.

Investigation of the bacterial flora in some two-hundred cases have yielded a wide variety of organisms including enterococcus, various streptococci, paratyphosus A and B, considerable numbers of unidentified salmonella, *S. dysenteriae* Flexner and Sonne-Duval, B. Morgani, and others of less apparent potential importance. We have not been able to obtain evidence convincing to us, that the disease is the result of a specific infection. Similarly, evaluation of the significance of many of these organisms is difficult if not impossible. Association even if continued is not acceptable evidence of pathogenicity. Likewise, demonstration of specific immune bodies is indicative only of a biologic association. And finally, conventional tests for pathogenicity do not warrant the assumption so often

made that because a given organism possesses lethal capacities for the mouse it is pathogenic for man.

### CLINICAL STUDIES

Continuing clinical studies which were carried on in parallel with the serologic and bacteriologic investigations, early indicated that certain physiologic changes in the gastro-intestinal tract contribute to the clinical picture. These appear to be secondary in nature, developing in the course of the disease, and becoming evident particularly in the severely ill patients.

The gastric secretory mechanism is not infrequently affected. The fractional expression with histamine stimulation reveals anacidity or hypoacidity in about forty per cent of all cases. This appears to contribute to the severity of the diarrhea and the amount of gas formation. Hyperacidity on the other hand is rarely encountered.

It is commonly believed, and stated in standard texts, that the diarrhea of chronic ulcerative colitis is the expression of intestinal hypermotility. Although this is true in certain instances it is by no means the rule. It is our practice to evaluate this factor by radiographic examination of the abdomen twenty-four hours after the administration of barium by mouth. During this period any drugs affecting intestinal motility are withheld and the patient receives his usual diet at the usual times. This technique actually has shown that hypermotility is much more uncommon than hypomotility and that in fact one frequently has to deal with the paradox of constipation in the presence of diarrhea. In these instances the barium meal remains in the right half of the colon despite frequent evacuations and its forward progress may be much delayed. In such individuals there appears to be a dissociation of colonic motor function. The proximal colon fails to empty at the normal rate and this is accompanied by overactivity and spasm of the distal portion. This dysfunction is commonly associated with frequent small evacuations of blood, mucus, and pus with relatively little fecal material. The cecum and ascending colon are frequently palpable and obviously distended. Severe abdominal pain, cramps, and tenesmus are usual. These symptoms almost invariably lead to the exhibition of opium and other sedative drugs. In the presence of hypomotility these preparations although relieving pain increase the dysfunction which is responsible for its presence.

Early in the course of the clinical investigation it became evident that multiple mixed deficiency states occurred not uncommonly (19). Actually, we have observed them at one time or another in the period of observation in one-hundred and seven of the two-hundred cases studied. They are not primary in the sense of antedating the onset of the colitis and there is no evidence to indicate that they constitute a factor in the primary mechanism of the disease. They do, however, contribute most importantly to the clinical picture and to the pathologic physiology. When unrecognized or improperly treated they are progressive and ultimately may become the dominant factor directly determining the outcome.

The clinical phenomena of these mixed deficiencies, as well as the laboratory findings, indicate that they are the result of inadequate supplies of vitamins, biologically complete protein and mineral salts. They arise as the result of several different mechanisms. The conventional smooth or "colitis" diet supplies none too much of these essential factors. When such a diet is further limited, as is often

done, important grades of avitaminosis occur. Especially is this true of such restricted dietaries as the apple and tea regime. We have observed numerous instances of primary deficiency disease, that is, deficiencies directly attributable to faulty therapeutic diets. In certain instances these have presented the complete clinical pictures of florid pellagra with psychotic manifestations or those of acute beriberi. In many others ascorbic acid and vitamin K deficiencies have contributed importantly to the degree of blood loss, and A and B complex deficiencies to the malnutrition, inanition, and inhibition of growth and development which is such a common complication of the disease in children.

The deficiency states occurring in ulcerative colitis involve factors other than the vitamins, however. Hypoproteinemia with edema and anasarca is not rare in improperly treated cases. Disturbances of calcium-phosphorus balance, even with clinical tetany, occur. And the anemia so common in the chronic cases is often not to be explained on the basis of blood loss alone. This is commonly of the microcytic iron deficiency type. True macrocytic anemias which respond classically to the hematopoietic fraction of liver extract may be observed in the more severely ill patients. This anemia, however, is transitory in character and does not recur when the deficiency state has been corrected.

The deficiency states of ulcerative colitis are probably more commonly secondary or conditioned, than primary or dietary in origin. When clinical evidence of this complication is present, characteristic changes in the small intestine are easily demonstrable by X-ray (20). Identical changes are present in the small intestine in sprue and regress under effective therapy (21). This latter disease has been shown to be accompanied by defective absorption from the intestinal tract. By inference, therefore, the development of deficiency states and the accompanying changes in the small intestine progressively interfere with absorption and tend to create a vicious spiral of disturbed physiology. The factors responsible for the appearance and progression of the intestinal changes have not certainly been identified. Clinical data, however, suggest that insufficient supply of the vitamin B complex may be responsible (22). It is possible, therefore, that a greater proportion of these deficiency states are primary, or dietary in origin, than has usually been suspected.

Recognition of these nutritional problems rests primarily on evaluation of symptoms and physical signs, and only secondarily on laboratory procedures. Approximately fifty per cent of cases present clinical indications of avitaminosis. These are most commonly to be observed in the tongue, which early presents swelling and redness of the fungiform papillae at the tip. When progression occurs, acute diffuse glossitis, serpiginous ulceration or discrete aphthae, and finally diffuse smooth atrophy seem to occur in sequence. Diffuse stomatitis and gingivitis, and aphthous ulcers of the buccal mucosa may occur in the advanced stages. The cheilosis and seborrheic accumulations in the naso-labial folds attributed to riboflavin deficiency may be present. The skin likewise may reveal the dryness and hyperkeratosis follicularis which are associated with vitamin A deficiency. The anorexia, muscle tenderness and neurologic changes of thiamin deficiency are likewise not uncommon.

It is an old observation that exacerbation or recurrence of the colitis may follow upon an acute upper respiratory infection. Those who have used vaccine therapy

have had the unhappy experience of observing an acute flare up of the disease within a few hours after an overdosage of autogenous vaccine. Such events suggest the possibility of sensitization of the inflamed colon to foreign protein. Actually, experimental work with animals by several investigators has demonstrated that antigenic substances may be fixed in tissues which are inflamed, and that subsequently administration of the homologous antigen is followed by allergic inflammation (23, 24). Furthermore it has been shown that the colon may properly be classed as a "shock organ" (25).

Reference has already been made to the report some years ago that food allergy played a role in certain cases. We have been studying this factor intensively and have accumulated a considerable mass of data, as yet unpublished, which indicates that sensitization of the colon by food protein occurs commonly and that the sensitization frequently plays a fundamental role in the natural history of the disease.

Early accidental observations of inaccuracies of skin tests as guides to this aspect of diet therapy were the basis of the primary studies. Forty-five patients were investigated in series, first by the scratch or intracutaneous techniques, and then by the test diet method. Parallel findings were obtained only in three of the forty-five patients. Skin tests thereupon were abandoned and since then the elimination or test diet method has been used alone. Interpretations have been based upon subjective phenomena recorded by the patient, and objectively by the appearance of the mucosa of the rectum and recto-sigmoid at proctoscopy.

This aspect of the disease process has been studied in one-hundred and fifty of the two-hundred cases. Ninety of these have yielded subjective, and eighty-six objective evidence of sensitization of the colon to certain foods.

However, it appears that the degree of activity of the disease plays an important part in determining the availability of this evidence. The natural cycle of chronic ulcerative colitis may be divided into four quadrants: phase 1 representing active disease; phase 2 convalescence; phase 3 quiescence; and phase 4 early recurrence. Seventy-three per cent of the allergic cases yield satisfactory clinical evidence of food sensitization in phase 1. In phases 2 and 3 the incidence is only ten per cent and three per cent respectively. With phase 4, however, the percentage of positives rises to twenty. Nine per cent of our group have afforded evidence of sensitization in more than one phase. It is obvious, therefore, that demonstration of this factor may require repeated study by the test diet technique throughout one complete cycle of the disease.

These observations have led us to construct a working hypothesis concerning the disease mechanism which constitutes our present basis for study and treatment. It would appear that the condition is initiated by infection. This infection is non-specific in nature, varying from individual to individual, possessing only one common characteristic—invasive ability adequate to overcome host resistance. With the initial destruction of the mucosal barrier secondary infection by the common intestinal bacteria occurs as an inevitable corollary, and the factor of infection immediately becomes polyvalent.

The accompanying inflammation tends to fix in the affected tissues antigenic foreign protein of bacterial and dietary origin. This implies local tissue sensitization in the individual previously not subject to allergic phenomena. Again, reasoning from the sharply localized

pathology in many patients, the predictable response to certain foods in particular individuals, and the exacerbations or recurrence coincident with respiratory infection and vaccine overdosage, the cyclic phenomena of the disease may be explained as representing succeeding phases of sensitization and desensitization. Phase 1, that of active disease, is coincident with reactivity and spontaneous desensitization. It is in this period that a so-called allergic factor is most easily identifiable. Phases 2 and 3, respectively convalescence and quiescence, correspond to the non-reactive quadrants of the cycle, and it is in these phases that evidence of an allergic factor is least often demonstrable. Phase 4, however, would appear to correspond to the reappearance of sensitization and a reactive phase of the affected tissue. This is coincident with recurrence of active disease and a much greater probability of obtaining satisfactory evidence of allergy. We have, in fact, in a milk sensitive individual in phase 1 observed predictable response to the successive addition and withdrawal of this food, and have apparently abruptly terminated the process by milk free diet. This same individual, when healing was complete, was able to take milk without difficulty for twenty-four months. At the end of this period recurrence developed and again successive addition and withdrawal gave predictable results. Again immediate and complete cessation of the attack followed elimination of this food from the diet.

The period of active disease is likewise accompanied by the disturbances of physiology previously discussed, the development of deficiency states, the profound psychic disturbances often encountered, and the familiar complications such as abscess, fistula, and arthritis. The accompanying inflammation tends to spread by continuity in both the proximal and distal types, ultimately to involve, if unchecked, the entire colon and the distal ileum. This inflammation is productive in character with fibroblast proliferation. Additional scar tissue is formed with each succeeding acute episode resulting in progressive narrowing and shortening of the colon.

It is obvious that effective therapy must be based upon the polyvalent mechanism. We attempt to control the factor of infection by the use of autogenous vaccine when organisms of known or suspected pathogenicity are isolated, and by the use of the newer chemotherapeutic agents. Of these sulfathiazol seems the most promising.

Dietary treatment constitutes one of the most important methods of management. All of the dietaries should be high in protein and natural vitamin sources, and low in sugar and starch. Heavy dosage of vitamin supplements are frequently required for the more severely ill patients. Following an observation period to establish a base line on the general high protein diet, a series of test diets are used for periods of from four days to a week each. Evaluation is based in part on symptoms, but largely on direct inspection of the mucosa of the rectum and recto-sigmoid. It may be of fundamental importance to repeat this study in each of the four quadrants of the disease.

Of almost equal importance is demonstration of the disturbances of physiology of the stomach and intestinal tract, particularly those of motor function. Hydrochloric acid is given in the presence of anacidity. If the twenty-four hour radiographic examination reveals a rapid motor rate, sedative and antispasmodic therapy are used. If on the other hand there is pronounced delay in the right half of the colon, a single large dose of

castor oil is followed by the administration each morning of a small dose of sodium sulphate. This frequently acts to reduce both the pain and cramps, and to diminish the total number of stools each day. It seems to us both illogical and unwise to attempt artificially to produce formed stools until healing is well under way.

The test of any philosophy of disease and the therapy based upon it is to be found in the follow-up clinic. It is pertinent, therefore, to present briefly the clinical results obtained by application to patients of the principles involved in this hypothesis. One-hundred and forty-six cases have been treated by medical measures alone. Forty-two of these are "apparently arrested" for periods ranging from months to six years. Fifty-eight are improved. Forty-one are unimproved. Five have died. These results are not brilliant in terms of percentages. Many of the individuals, however, are psychically weak, many are relatively uneducated, and many have been under considerable economic stress. All of these factors imply inability to adhere rigidly to the prolonged system of controlled study which seems essential in this disease.

The forty-one of the one-hundred and forty-six cases treated medically who are unimproved inevitably raise the question of surgical therapy. This must be considered with respect to emergency and elective procedures. The former, in our experience, have been accompanied by a prohibitively high mortality and seem rarely justifiable. Elective surgery, however, which implies in the great majority of instances permanent iliostomy and subsequent resection of the colon, need not be accompanied by a high mortality rate, and will rehabilitate many patients who otherwise would be permanent invalids. The selection of these individuals, however, entails the most careful study of the disease mechanism in each instance. Deformity of the colon and even extensive pseudopolyposis are not sufficient indications of themselves. Not infrequently application of the principles of medical management which have been discussed will prove adequate. It is our conviction that elective surgery becomes a justifiable form of therapy only when these factors have been thoroughly investigated, adequately controlled, and the indicated procedures operative over a period of time sufficient to evaluate clearly the results of conservative treatment. This implies observation of the patient, both by the surgeon and by the internist, throughout one complete cycle of the disease.

This experience leads us to believe that chronic ulcerative colitis is a cyclic recurrent disease, of polyvalent, complex and incompletely-known etiology. Factors which are operative in the mechanism in one phase are absent in others. Evaluation of these factors and their control will lead to "apparent arrest" of the disease in twenty-nine per cent of cases, and to satisfactory improvement in an additional thirty-nine per cent. The remainder fall within the joint province of the internist and the surgeon. Decision in such instances must be based upon the many and varying problems presented by the individual patient.

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# The Cell-Parasite Relationship in Bacterial and Virus Infection*

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INFECTIOUS disease represents an instance of the curiously inequitable interaction of two kinds of living beings in which all of the benefit, if any, accrues to the one and no end of harm to the other. If it were only possible to forget for the moment the predatory aspects of parasitism, and the phenomenon of predation in general as it affects mankind, we might be soothed by the thought that infectious disease is only a phase, regrettable perhaps, in an evolutionary progress toward peace and harmony through adaptation. But all of our efforts as medical practitioners and scientists deny human willingness to submit patiently to the orderly processes of nature implied in so liberal an interpretation; and if our deliberate attempts to interfere with the host-parasite relation may be construed as part and parcel of an evolutionary process of elimination, then the very existence of at least human parasites must be denounced by us as an unfortunate mistake.

This onesided biological view, however, would hardly meet with applause from the parasites, for they no doubt would contend that the victims of infectious disease only suffer the consequence of an inefficient hospitality. They could cite for example the more tolerant adaptability of insects and other arthropods, much older in worldly experience than we, that have learned to entertain and support their uninvited guests from generation to generation until they would feel quite lost without them; although they are taxed with the grocery bill and at times have found it necessary to launch a housing project to construct in their intestinal slums especially designed cellular accommodations.

Whatever may be the underlying philosophy of the obvious maladjustment as judged by human complaints, it is of interest to the investigator to enquire into the circumstances of infectious disease in order to interpret so far as he is able the mechanism at work, irrespective of any partisan claims of the contestants; and it is to some observations my colleagues and I have made upon the host-parasite relation that I should like to direct your attention this evening, limiting my consideration for the most part to the behavior of a few viruses and certain bacteria as the parasitic agents, in relation particularly to parasitized cells during early stages of initial infection of the host.

In respect to the bacteria, it is a simpler matter to observe their relations, for they are large enough to be seen by means of the microscope, especially when they are suitably stained, but the viruses must be followed more indirectly because they are so small. The ones I shall consider, however, induce specific changes in some of the cells they affect that are recognizable

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in the form of so-called "inclusions" which occur either in the cytoplasm or in the nucleus of infected cells; and by identifying and tracing these inclusions and by demonstrating the virus in association with their presence it is possible to formulate an interpretation of the course of events.

Our studies of experimental infection and of naturally occurring virus diseases led us some time ago to accept as a working hypothesis the theorem that viruses as a class require the internal medium of living cells for their multiplication. There was at hand much evidence favorable to this postulate and little or nothing against it, but it seemed worth while to obtain more direct substantiation. Experience with a virus disease of chickens, namely fowl-pox, appeared to offer the best experimental opportunity to test the assumption and as a result of our attempts in this direction Dr. C. E. Woodruff and I were able to prove the intracellular presence of fowl-pox virus and to show its relation to the Bollinger body, the specific cellular inclusion of this disease (1). Investigations a few years before of experimental infection in rabbits with the virus of fever blisters or herpes simplex led Teague and me to the conclusion that this agent progressed from a peripheral focus of infection to the central nervous system by means of propagation along the axis-cylinders from exposed termini of neurons (2). Because the neural processes are cytoplasmic ramifications of ganglion cells it seemed evident to us that the living nerve-cell including its processes served not only as a medium for propagating the virus but as a structural mechanism for extension of the infection within nervous tissue (3). We were thus able by our experiments to confirm the idea proposed earlier by Di Vestea and Zagari to explain the pathogenesis of rabies (4).

The concept of cytotropism of viruses based upon the hypothesis of exclusive multiplication within living cells has served to clarify many aspects of the pathology and pathogenesis of virus lesions and diseases, and remains a stimulating idea for future fruitful investigations (5).

In the course of these studies upon the cytology and pathogenesis of virus infections Dr. A. M. Woodruff and I had occasion to resort to the use of the living chick embryo as an experimental animal for our work, first with fowl-pox, and later in collaboration with several associates, with other viruses (6). This method, formerly utilized by Murphy for the propagation of a neoplastic disease of chickens, proved to be a very useful one, and has been of value not only for cytological investigations but for the making of vaccines and for modifying certain viruses (7). Not only are cells of the chick embryo susceptible to a large number of viruses in pure strain but Dr. Anderson in my laboratory has recently confirmed the observations of Syverton and Berry that a single cell can serve as host to more than one virus (8, 9). Dr. Anderson first inoculated the ectodermal surface of the chorio-allantois with fowl-pox virus, and because its activity is relatively slow, she waited three days and then reinoculated the same area with the virus of herpes simplex. Seventy-two hours later the lesion was removed and studied histologically. In single cells both the cytoplasmic inclusion of fowl-pox and the intranuclear inclusion of herpes were clearly demonstrated. These inclusions are morphological expressions of what is interpreted to be the intracellular activity of each of these viruses. Similar combined infections were obtained with vaccinia virus and herpes, and with the latte

combined with rabies. Thus accumulating evidence is constantly strengthening the hypothesis of cytotropism which postulates a necessary cell-virus relation.

We have been particularly interested in the facility the chick embryo affords us for studying the pathology and pathogenesis of a wide variety of virus infections. The tissues of this host are susceptible to a large number of viruses, some of which are not easily inoculable into other animals; and some of them are non-infectious for the newly hatched chick itself.

The constant susceptibility of the chick embryo at definite stages of its development to infection by a variety of viruses affords an opportunity to make comparative studies of the behavior of these agents in the same relatively uniform and previously uninfected host. This fact and repeated observations upon accidentally acquired bacterial infections in the course of our virus work led us to explore the reactions of the embryonic tissues to some of these parasitic agents of disease that are better known biologically than the viruses. The success of Levaditi and Borrel many years ago in infecting developing eggs with the spirillum of fowl septicemia was an encouraging incident (10). We set about, therefore, to study rather systematically some of the well-known bacteria as infectious agents for the embryo. Dr. Anderson and I were able to show that a number of bacterial species would induce characteristic lesions and could be carried forward in pure strain in this sterile living host (11). It was not altogether surprising but nevertheless gratifying to find that several of them induced lesions, representing response of the embryo, very much like those of the natural host. This was brought out especially clearly in experiments with the whooping-cough bacillus and with the meningococcus for which there are no readily accessible experimental animals. If H. pertussis were injected into the amniotic sac of embryos of 12 days incubation the microorganism would grow on the surface of respiratory epithelium as soon as cilia developed, just as they do in the human subject (12); while the meningococcus similarly placed grew in the cranial sinuses, bringing about suppuration, and not infrequently reached the meninges, by means of the blood stream, according to Buddingh and Polk, to set up a suppurative inflammation there quite like that of epidemic meningitis in a child (13). This has not been accomplished with certainty, so far as I know, in any other experimental animal.

Because chick embryos do not possess specific antibodies for these microorganisms, in the absence of infection of the hen, and contain no demonstrable complement during the period of the experimental observations, it was possible for Buddingh and Polk to use them to demonstrate the relative effectiveness of immune serum and its products, by injecting the antibodies intravenously.

These experiences had convinced us of the usefulness of the chick embryo for studies of infection of various kinds, and especially for observations upon the phenomena associated with the earliest stages, concerning which there is little detailed knowledge.

It is well-known but not generally stated clearly and frankly that there are few bacterial diseases of man that can be reproduced in the ordinary varieties of experimental animals. It is true that the typhoid bacillus for example will infect rabbits under experimental conditions but the resultant disease is not typhoid fever. Our experience with several kinds of bacteria however indicated that the initial responses of the infected embryo, devoid of immunity and delicately susceptible,

were so much like those of known reactions of natural hosts that they gave us some assurance in attempting to correlate them with those presumed to occur in the corresponding natural disease.

We were particularly interested in the earliest changes at the portal of entry and during the initial phase that is noncommitally known as the incubation period, during which there might be in man no clinical manifestation of disease. Because so little is known about initial infection with any of the bacteria pathogenic for man, several of my associates are conducting at the present time a sort of preliminary survey of the behavior of several species following inoculation of the chorioallantoic membranes and other regions of chick embryos, and of the responses of the avian embryonic cells and tissues to the resulting infection.

We conducted initial experiments of this kind a few years ago with the result that several common pathogenic bacterial species were found to be infective for the embryonic membrane; among these were S. aureus, S. hemolyticus, S. viridans, E. typhi, C. diphtheriae and B. abortus (11). The initial lesions induced appeared to be in general what one might expect at the portal of entry and locus of infection in man, but the fact was strikingly brought to our attention that in the case of some of the bacteria there was convincing evidence that the microorganisms were utilizing the living cells as media for growth and in some instances for extension to regions beyond. This fact might have been more surprising to us, inasmuch as the theory of phagocytosis had been so firmly established as a general principle of defense, save for the preparation experience with the viruses had given us for the idea of intracellular multiplication. This phenomenon in relation to bacteria was full of interest, and we came to the conclusion that the living cells of a host, as Robert Koch had observed many years ago, can in some cases serve as a nutrient medium for pathogenic bacteria and thus facilitate their invasion. In our current survey of bacterial infection in chick embryos we are giving much attention to this particular point, and it will serve us, it appears, as a criterion for a sort of biological classification of infectious strains and species and as an index of their virulence, based upon the host-cell-parasite relationship. This relationship has, as I shall discuss later, some interesting implications that possibly have a bearing not only upon pathogenesis, but upon immunity and perhaps chemotherapy. It emphasizes also the importance of a biological method of determining such factors as infectivity and virulence, as contrasted with in vitro cultural and biochemical characteristics.

Several years ago, before our own experiments upon bacterial infection in the chick embryo had begun, I made a rather brief attempt to classify infectious agents on the basis of the cell-parasite relation and concluded that there were those that never utilized an epi- or intra-cellular medium but always grew and invaded through the extra-cellular fluids; others at times could survive and grow within certain kinds of living cells but could also propagate outside; and a third group always required the living cell for their infective activity. In other words there were extracellular parasites, facultative epi- or intra-cellular parasites and obligate intracellular parasites (14).

Against this background I should like to describe some of our more recent experiments with a variety of pathogenic bacterial species infectious for man. In the first place I should like to consider some of those that we believe are exclusively extracellular in their requirements,

among which are the diphtheria bacillus, staphylococcus aureus, streptococcus hemolyticus, and the pneumococcus.

Dr. W. J. Cromartie has recently demonstrated in a manuscript now in press that the diphtheria bacillus will infect the embryo if inoculated into the amniotic fluid, and the infection can be carried along in series by means of successive transfers of amniotic fluid from embryo to embryo (15). This is the only experimental animal that I know of in which serial infections have been induced with the diphtheria bacillus, and the ready susceptibility of this host makes possible an experimental study of the lesions not easily practicable otherwise.

Following inoculation of the amniotic fluid the bacilli gain access to the paranasal sinuses and respiratory tract and grow abundantly in the fluids bathing them. The toxin formed acts destructively upon the superficial epithelium and upon the leucocytes, evidently enhancing thereby the growth-promoting quality of the medium. Large masses of the microorganisms appear and all of them are in an extracellular position. Previous administration of an adequate dose of diphtheria anti-toxin changes the picture markedly. In the absence of enrichment of the fluid medium by necrotic cells and inflammatory exudate, due to the neutralization of the toxin, the growth of bacilli is greatly restricted; the exposed mucosas stay intact, and mononuclear phagocytic cells remain uninjured, so that they phagocytose the bacteria, which do not seem to be able readily or at all to multiply within them. Thus the diphtheria bacillus behaves purely like an extracellular parasite under these experimental conditions.

Staphylococcus aureus grows abundantly for a while after inoculation of the chorio-allantoic membrane, forming multiple, compact, microscopic colonies. There is superficial ulceration of the ectodermal surface of the membrane and an abundant outpouring of polymorphonuclear leucocytes that soon form a purulent membrane incorporating the groups of cocci. The exudate and cocci may become rapidly separated from the original membrane by a zone of giant cells and granulation tissue. Phagocytosis occurs but, what is more important, the colonies of cocci are evidently inhibited in growth and dissemination by the leucocytic exudate, the presence of which alters the fluid environment so that it becomes a very poor nutrient medium for them. The membranal lesion may thus be characterized as a linear abscess.

Streptococcus hemolyticus is much more aggressive. It grows abundantly on the chorio-allantois, forming a continuous sheet. Cellular exudate containing a high proportion of mononuclear cells is poured out about and beneath them. The mononuclear cells phagocytose the cocci abundantly, but the cytoplasmic medium is evidently injurious to them because they tend to lose their original staining qualities and to become extremely minute, gram-negative granules. Although the streptococci do not invade the membrane easily, they induce great local injury, especially to the blood vessels in the mesoderm, probably by their products, so that thrombosis and necrosis of the chorio-allantois occurs. The necrotic tissue seems to alter the medium favorably for their continued growth. Histologically there is no evidence of a particular predisposition of Streptococcus hemolyticus to invade the blood vessels, although positive cultures can be obtained from the heart's blood.

Certain strains of Streptococcus viridans behave very differently, and although they cause relatively little damage to the chorio-allantois, they invade

rapidly and multiply abundantly inside living cells, utilizing fibroblasts, mononuclear cells and vascular endothelium (16). Their rapid penetration into the embryo and their vigorous multiplication both intra- and extra-cellularly cause lesions to appear in a number of organs. One recent strain studied by Dr. Cromartie, derived from a blood culture of a case of acute endocarditis, localized in the endothelium and intima of the embryonic cardiac valves, resulting in acute vegetations within 24 hours after inoculation. This was not an organ selection, however, because vascular endothelium everywhere contained them and afforded them nourishment.

It is evident from our own and Dr. Cromartie's experiments that at least some strains of S. viridans are capable of utilizing freely the living, fixed, endothelial cells and mononuclear wandering cells for multiplication and extension, in contrast with several strains of S. hemolyticus that apparently grow only extracellularly and are injured by the intracellular environment.

Like S. hemolyticus, though manifesting less virulence, the strains of pneumococcus that we have used grow only extracellularly. At times the diplococci will multiply abundantly in the interstitial lymph of connective tissues within the embryo, but phagocytosis is minimal and there is no evidence of intracellular proliferation. In general, the environment afforded by the chick embryo is not very favorable for the pneumococcus.

Simulating somewhat the general behavior of S. viridans, the meningococcus, as demonstrated by Buddingh and Polk, especially in embryos of 9 or 10 days incubation, spreads rapidly from the surface of the chorio-allantois to penetrate blood vessels; and utilizes to some extent the endothelial cells for its growth.

Although it is evident to one who has studied the early lesions induced by pure strains of the aforementioned pathogenic bacteria, as they occur in the susceptible tissues of comparable stages of the chick embryo, that C. diphtheriae, S. hemolyticus, S. aureus and the pneumococcus find the extracellular fluids to be the only media affording them suitable conditions for growth in this animal, S. viridans and the meningococcus can in addition thrive and multiply to some extent within the cytoplasm of certain living cells.

The phenomenon of facultative intracellular parasitism can be strikingly illustrated by other types of bacteria that have not received in the past such thorough study with respect to pathogenesis as have those just mentioned, namely, Bacterium tularense, Brucella abortus and Pasteurella pestis, gram-negative bacilli that are carried by lower animals and in part transmitted by insects.

Councilman and Strong were the first to demonstrate the capacity of B. tularense to multiply within cells, notably hepatic cells and endothelium of the guinea pig (17). Francis later described and pictured the multiplication of these bacilli, apparently exclusively in epithelial cells, of the gut of the tick *Dermacentor andersoni* that transmits them to other hosts (18). In respect to their clinical and superficial pathological manifestations tularemia has been likened to bubonic plague; besides, P. pestis is transmitted by an arthropod, the rat flea, and readily infects through the skin, resulting like tularemia in suppurative lesions of lymph nodes. So far as I know, however, there have been no direct observations upon the capacity of the plague bacillus to grow within cells of its mammalian hosts, although it does not multiply in cells of the flea, but grows within the lumen of the stomach to such

an extent as to obstruct the esophagus, which results in regurgitation and contamination of oral discharges (19). Several years ago Theobald Smith described the invasion of chorionic epithelium of the cow's placenta by B. abortus and its abundant multiplication there (20). The possibility of its transmission by arthropods has been suggested (21).

These three types of bacteria are pathogenic for the chick embryo and it is therefore possible to make a comparative study of their earliest lesions in the chorio-allantois and elsewhere, as well as to observe clearly their relation to cells in the pathogenesis of the lesions they induce. This study illustrates very well the great value of the chick embryo with its uniform and susceptible tissues as an experimental host in which comparison may be made, because it demonstrates among other things that the behaviors of B. tularense and of P. pestis are quite different in the infected animal, although the general and superficial effects in mammals as manifested by disease are strikingly similar. P. abortus differs from both, and its behavior as a pathogenic agent, while comparable with B. tularense, is unique and full of interest. The pathogenesis of these infections in chick embryos is at present the subject of investigation by Drs. Buddingh and Womack, to whom I am indebted for the present account.

If B. tularense is placed on the chorio-allantois of 12 to 14-day chick embryos, infection takes place rapidly and the embryos die within 96 hours. The site of inoculation becomes somewhat opaque from superficial ulceration and the outpouring of a moderate amount of polymorphonuclear leucocytic exudate, but there is not any extreme change. The microorganisms invade the embryo and induce focal lesions in the liver, spleen and heart.

The changes which interest us particularly are those associated with the early stages of infection in the membrane. Here the minute bacilli soon begin multiplication, especially if there is some blood on the chorio-allantois; and rapidly invade ectodermal epithelial cells, in whose cytoplasm they grow in great number, causing the cytoplasm to become enormously distended just as in the tick's gut. That the cells remain alive during this process is indicated by the fact that their surfaces persist intact and the nuclei, forced to a peripheral position, retain their outline and staining qualities. After a while, however, the cell either ruptures or dies and a spherical colony of bacilli remains to spread the infection as it disintegrates. About the free-growing bacilli and those liberated by cellular disintegration polymorphonuclear cells rapidly accumulate and one loses sight of them, for they do not thrive in a purulent exudate, though there is no evidence in sections of phagocytosis by the leucocytes.

At eighty hours, the longest period of survival available, there is necrosis of the mesoderm and in this necrotic material, which seems to enrich the extracellular medium, the bacilli are present in great numbers, as if growing, but not in compact masses. In the outer living tissue the microorganisms are seen only as small aggregations in the cytoplasm of fibroblasts and large mononuclear cells. They do not appear in the extracellular fluid where the tissue is alive. All of the cytological indications thus point to the capacity of B. tularense to grow within living cells, especially abundantly in those of the ectodermal surface. Once that is penetrated they can grow extracellularly in the presence of necrotic tissue

but invade the living membrane by means of viable fibroblasts and mononuclear cells. They do not seem to find the cytoplasm of the latter so congenial a medium as is that of the epithelium; and they do not appear in the cells of the entoderm, although entodermal cells of the tick's intestine support them in the arthropod host.

Interestingly contrasting with this picture is that resulting from infection of the chorio-allantois with Brucella abortus. There is probably some early growth of the bacilli in the bloody fluid overlying the ectoderm of the membrane but little evidence of it is seen. A moderate cellular exudate is rapidly formed that consists not only of polymorphonuclear cells, but, in considerable proportion, of the large mononuclear variety. The first evidence of bacterial growth in the microscopic sections is in the cytoplasm of these large phagocytes. They become greatly distended with the small bacilli and appear as discrete spherical masses in the pus at the 24-hour interval. After 48 hours one sees a considerable sprinkling of infected underlying epithelial cells that stand out because of their large size and bacillary content. There is little or no necrosis or ulceration, and cellular exudate, except in response to the initial inoculum, is scanty. At 96 hours the microorganisms have reached the endothelial cells of the capillary zone and here, within the endothelial cytoplasm, they find an optimum environment for growth (some strains grow in other mesodermal cells). The endothelial cells are distended to the bursting point with the tiny bacilli and the infection extends from cell to cell, sometimes outlining the capillary zone with a compact layer of infected endothelium almost as thick as the epithelial zone above.

This propensity for invading and growing within endothelium results frequently in hemorrhage, and in the hemorrhagic fluid the bacilli appear to be able to multiply to some extent extracellularly. There is little cellular exudate in the mesoderm, and intracellular growth is with one strain almost completely confined to endothelium; another strain invades large mononuclears and fibroblasts in the membrane. Although the bacilli in late stages penetrate the membrane and grow in the allantoic fluid so as to overlie the entoderm, there is no invasion of these cells. Invasion of the body of the embryo is through endothelial- and mononuclear-cell infection; and the secondary foci in the renal glomeruli, in the liver and elsewhere, are the results of local infection of the cells lining the blood vessels. In the liver there is also invasion of hepatic parenchymal cells, resembling closely Councilman's description of tularemia in guinea pigs.

Thus while B. tularense grows particularly well in ectodermal epithelium and to a less extent in fibroblasts and mononuclear cells, showing no predilection for endothelium, Brucella abortus may pick out endothelial cells almost specifically, although it, too, can utilize epithelium, fibroblasts and free mononuclear cells. In contrast to both is the behavior of the bacillus of bubonic plague.

Pasteurella pestis is a relatively large bacterium, particularly so when it is growing in infected tissue; consequently it is easily demonstrated. After inoculation of the ectodermal surface of the chorio-allantois in the usual way, the bacilli grow with great rapidity, forming a thick layer in 24 hours overlying a zone of leucocytic exudate. Even at this early stage some of the microorganisms have already penetrated the epithelial

layer to form massive colonies in the mesoderm. Hemorrhage from rupture of large and small blood vessels, all of which are excessively dilated, is an early complication. At 48 hours the infection is more intense, varying in degree apparently as a result of the quantity of initial growth. The result, however, to which the mesodermal lesions tend is a pustule with a prominent nucleus of densely packed large bacilli about which, and to a certain extent within, are scattered polymorphonuclear leucocytes. About the margin of the colony are mononuclear phagocytes greatly distended with bacilli much smaller in size than the extracellular ones. In the ectoderm relatively few epithelial cells are invaded.

If my interpretation of these lesions is correct, they indicate a great power of extracellular growth on the part of P. pestis. The bacillus gains access to both epithelial cells and mononuclear phagocytes as the lesion progresses, and is capable of multiplying in each, but does not find optimum conditions there, as is indicated, perhaps, by the small size of the intracellular forms. In the less massive foci polymorphonuclear leucocytes and mononuclear phagocytes surround the nucleus of extracellular bacilli, forming the structure of an abscess although there is very little general cellular exudate. Injury induced by the infection is expressed remarkably by the great engorgement of blood vessels and focal hemorrhages. This vascular response corresponds quite closely with that described in the lesions of human plague (22).

The chief points of interest in these three experimental infections for the purposes of this discussion concern the cell-parasite relationship. Each of the infecting microorganisms is capable of growing extracellularly, B. tularense and B. abortus at most and perhaps only in association with dead tissue, while P. pestis can multiply prodigiously in the interstices between living cells, and in fact causes relatively little necrosis early, although as a result of vascular damage local death shortly ensues. The plague bacillus does not however appear to grow in the circulating blood. B. tularense finds excellent conditions for growth in the ectodermal epithelium of the chorio-allantois, and sufficiently inviting environments within fibroblasts and mononuclear cells, for its invasion into living tissue; while P. pestis, able to survive and grow in similar cells, does so to less advantage than outside. On the other hand, B. abortus, first entering ectodermal epithelium, soon finds within endothelial cells, particularly of adjacent capillaries, or in mononuclear cells and fibroblasts, abundant nourishment and prefers this medium, apparently to the exclusion of the extracellular environment, even in its metastases to the tissues of the embryo itself.

In attempting to determine the comparative significance of the experimental infections of the chorio-allantois that I have briefly described, one would first of all inquire whether they are purely artificial and expressive of conditions impossible of duplication in nature or, on the other hand, are representative of host-parasite and cell-parasite relations similar to those that might be expected to occur under natural conditions in human hosts.

In considering this question there is a general point of view that seems to me worthy of presentation; namely, that in the initial stages of primary acute infections it appears likely that in the natural host there is a vulnerable channel or portal which offers the invader, during the so-called period of invasion and in-

cubation, optimum conditions for parasitization. No reactions of immunity have as yet taken place and there is no manifest disease. A little later there may develop suddenly or gradually antagonistic conditions, either specific and general or local through injury and inflammation. These responses to the infection may alter profoundly the general or local environment of the infectious agent in a short time.

It has been of great interest to us to observe that the chick embryo does not respond to infection by the production of specific antibodies, although inflammatory phenomena locally simulate in quality those occurring in the human host. The chick embryo furthermore seems to have little or no natural immunity of cell types ordinarily susceptible to particular viruses or bacteria in the usual hosts, at least until the last few days of incubation. At certain stages the embryo seems to offer in a way very similar to the natural host specifically favorable environments for the infectious agent. To illustrate this idea I would refer to infection of man and of chick embryos with H. pertussis. Human infection with the whooping-cough bacillus seems dependent upon the presence of the ciliated surfaces of the epithelial membranes of the respiratory tract, in intimate relation with which the bacilli grow. These ciliated surfaces constitute for this pathogenic bacterium an optimum environment for its parasitization. In our experience the injection of H. pertussis into the amnion of embryos induces no lesion until about the 14th day, at which time cilia make their appearance. Then the bacilli proceed to grow abundantly in intimate relation with them.

The environment for a particular microorganism may vary from time to time in the development of the embryo and in the human host. Thus in early stages of development inoculation of the embryo with meningococcus results in a generalized blood-borne infection, while inoculation into the amnion of embryos incubated 14 days results in sinusitis and not infrequently in suppurative meningitis. Each stage has a degree of susceptibility all its own. These two infections that simulate so closely in their form and mechanism those occurring naturally in man indicate that a relative absence of natural immunity and the presence of specifically favorable environments permit the embryo to serve the parasite much in the same manner as do their natural hosts. Reproduction of early lesions of whooping-cough and of meningitis in chick embryos was of considerable encouragement to us in attempts to continue studies of bacterial infection, because they had not theretofore been reproduced in other laboratory animals, presumably because of varying degrees of natural immunity.

In many of the experimental bacterial infections that we have studied, including those I have just described, there is good justification, it seems to me, for concluding that the initial lesions are significantly similar to comparable stages in human infections with the same microorganisms. It could hardly be expected that the whole varying course of a specific human disease could be reproduced in these immature animals, because of the great complexity and immunologic reactivity of the free-living animal. In human pathology, however, there is a dearth of knowledge of the earliest phases of specific infections, partly because of lack of opportunity to observe primary lesions during this period. Knowledge to be gained from studies of initial infection in the embryo,

therefore, should help to supplement the picture we possess.

If the judgement is correct that the early lesions of certain bacterial infections in the chick embryo are comparable with those that occur in the same infections of the human host, we may assume that while certain bacterial species find optimum conditions for growth and invasion in extracellular fluids, there are others and quite as numerous ones, that find their most congenial environment within or on the bodies of certain living cells; that is, there are facultative intra- and epi-cellular bacterial parasites.

When one looks broadly at infection this does not seem strange, for every indication points to the necessity of a living intracellular environment for the multiplication of viruses, the bacteria-like rickettsias and for many protozoa. Indeed, if we may judge from morphological appearances, there are likewise true bacterial infections that are caused by obligate intracellular parasites, notably the bacilli of rat and human leprosy, and among lower forms a great variety of hereditary parasites of arthropods, even of the unicellular paramecium.

Our experiments point to the participation of two very different relationships between the parasitized cell and the invading microorganisms of distinct species. The one is reflected in lesions caused by the plague bacillus. This bacterium obviously finds that local extracellular conditions offer maximum facilities for its abundant growth and it builds up focally in this environment massive microscopic colonies of large and vigorous forms. Nevertheless, the bacillus is to be found likewise in the cytoplasm of some epithelial cells and many large mononuclears, in numbers and in a form that indicate its multiplication within them, but in a much smaller size and apparently with less rapidity than without. The contrast indicates that the intracellular medium is not so congenial to its reproductive functions and to its nourishment as the extracellular medium. I interpret this to mean that the bacillus of plague is a very self-reliant parasite in the tissues of a susceptible host and possesses in a high degree the enzymic or other qualifications that can sustain its growth even under certain disadvantages. The cytoplasm of the invaded cell has nothing to offer as a special inducement for its growth; on the contrary, it tends to restrict it without being able to destroy it or inhibit it completely.

In contrast to this we find Bacterium tularense and Brucella abortus apparently almost completely dependent upon the intracellular environment for growth in the living unaltered tissues. With respect to them the invaded host-cell seems to afford a stimulus or to supplement a deficiency in these parasites, of which they take ready advantage. In the one case the cellular parasitism is for the invader only an adventitious relation, in the other an advantageous one. This difference may be reflected, too, I believe, in the relative difficulty of establishing primary cultures of B. tularense on artificial media, as compared with the easy adaptability of P. pestis to similar in vitro conditions.

The spread of bacterial infection from cell to cell, by mitosis and by dissemination through death or rupture, presents a mechanism of pathogenesis quite distinct from that obtaining in extracellular parasitic infections and may be likened only to the invasion and spread of viruses, rickettsias and other obligate-cytotropic agents. Furthermore, like these pathogenic agents there is in evidence in certain bacterial infections a cell-selectivity

determined, no doubt, by the relative congeniality of the environment offered.

There is an interesting parallelism of pathogenesis between rickettsial infection and that of B. tularense. Both are parasites of insects and in the bodies of these arthropods they inhabit living cells. In mammalian hosts a similar cell-parasite relation obtains. The pathogenic rickettsias however are for the most part at least obligate cellular parasites, while B. tularense can be cultivated, although at first with difficulty, extracellularly. In this connection it is of some interest to speculate about B. abortus, which resembles in its pathogenesis in the chick embryo B. tularense, being essentially an intracellular parasite. Possibly it, likewise, was at one time an inhabiter of arthropod hosts, but has developed mechanisms for sustaining itself in mammals without the necessity of insect intervention. In the course of time perhaps B. tularense might likewise develop an independent cycle in vertebrates. Pasteurella pestis, on the other hand, is of a different order, at least at present, and has either lost completely a former reliance on an intracellular environment in arthropods or is in the process of becoming adapted to them. It has now such an extraordinary self-perpetuating growth independency that it must of necessity lose some of its properties before it becomes dependent upon contributions from an intracellular environment in any of its hosts.

Ability of parasites to utilize the intracellular apparatus no doubt has implications of great importance, and I am inclined to venture a few speculations concerning some of them, in the first place relative to immunity and the duration of certain bacterial infections. We must attribute a rôle of major importance in immunity mechanisms to circulating antibodies; and probably to a great extent the duration of an infectious disease is dependent upon the effectiveness of the antigens concerned; but granting potent circulating antibodies, it is those infectious agents that are able to survive and persist, even to grow, within living cells that are most apt to escape their antagonistic effect; and taking advantage later of a lowering of the antibody concentration and other favorable factors, they may renew the attack. Streptococcus viridans, for example, Bacterium tularense and Brucella possess this capacity, as demonstrated by the chick embryo experiments, and indeed infection with these agents, as is well known, may be of relatively long duration, and in some cases recurrent.

Some observations which Dr. Adams and I have recently made upon intestinal and lymphoid lesions of typhoid fever indicate that in this familiar bacterial disease of relatively long duration, there is an intracellular phase of the infecting bacillus that permits its persistence and growth within the body in the interior of plasma cells even after humoral antibodies have reached a high concentration (23) (24).

Another speculation has to do with the relative effectiveness of chemotherapy of the kind that is so prominent in our minds and practice of late. So far as I am aware, the successful results from the use of drugs of the sulfonamid group are obtained in just those infections that are caused by bacteria which lead practically exclusively, if not entirely, an extracellular parasitic existence; whereas against the virus diseases, excepting with some reservations lymphogranulomatosis and trachoma, and against those due to rickettsias and obligate intracellular parasites in general, they are quite ineffective (25). At present,

in fact, they are of questionable curative value in those infections that are caused by some of the facultative intra-cellular bacterial diseases which I have been discussing—namely, undulant fever, tularemia, typhoid fever, and chronic infections with S. viridans. It is not surprising, however, that they are reported to benefit plague (26). While speculating, one might raise the question whether or not these chemical agents, though circulating in high concentration in the blood, even present intracellularly, can so alter conditions within cells as to render them unsuitable for protecting and nourishing their parasitic guests. It is possible that chemicals of an entirely different nature and pharmacological action would be required, to suppress the intracellular parasite not by direct action upon its own enzymic systems, but upon those of the host-cell that supplement or even replace them.

Perhaps we are too impatient. After all, the tendency of parasites to adapt themselves to an intracellular environment might be an assurance that nature left alone to its evolutionary maneuvers is designing us to be more efficient hosts, just as the insects have become for some of their parasites; and thereupon would be removed naturally and automatically the stigmata of our present infectious diseases. If we were not so impetuous, a few millennia of progress would doubtless resolve for us more problems than these that presently beset and trouble us. But such a broad indictment of our generic lack of forbearance in no way impugns the courteous and durable quality of *your* patience this evening.

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# The Concept of the Specific in Medicine*

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WERE it the custom now, as it was in the days of Lucretius, to begin one's discourse with an invocation to the gods, I should begin mine by calling upon three of the godly figures in the realm of philosophy. I should invoke the patronage and favor of Pythagoras, of Protagoras, and of Kant. This trinity, from among the great in human thought, I would set at the head of my thesis, to bear witness to that which alone was common to their differing systems of philosophy, and to which I, too, would on this occasion make my modest contribution.

These three, whose lives span two millennia, more perhaps than any others have in their various ways endeavored to teach us that the human understanding creates the laws of phenomenal nature. "By actively uniting together the facts of sense, human understanding creates the whole organization, the coherence, the unity, the sanity, of our world of business, of society, and of science" (1).

But though I invoke the spirit of these men, it is not my intention to reargue the *Theaetetus* of Plato, nor even to trace the thread of "critical philosophy" that runs from the mystical figure of the great Pythagoras, to whom all knowledge was framed in mathematics, through Protagoras, who maintained that man is the measure of all things, to Kant, whose *Critique of pure reason*, published in 1781, marks one of the great turning points in the history of philosophy. My intention rather is to focus attention on that which is all too much and too often forgotten, save among some few psychologists, namely, that the instrument of cognition is as deserving of study and attention as the data of knowledge. To guard lest I fall into that error so passionately decried by Francis Bacon, wherein by a kind of degenerate learning one causes "good and sound knowledge to putrify and dissolve into a number of subtle, idle, unwholesome, and vermiculate questions" (2), I intend not to pursue this subject directly but rather through a critical scrutiny of the history of the concept of the specific in medicine.

Yet, I must stay long enough on the threshold of my subject to pay my respects to Bacon, who, as his contemporary, William Harvey, has said, wrote of science like a Lord Chancellor. Bacon had cast obloquy on the study of the cognitive processes, and his words have been echoed down the ages. His analogy of the wit and mind of man, which when working upon itself "is like the spider bringing forth cobwebs of learning, admirable for the fineness of thread and work, but of no substance or profit," has been taken in earnest by the uncritical. Science has for too long left the problem of cognition to the philosophers and the psychologists, and has gone on in its own merry way as if that problem were not its concern. As a result,

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science, and notably medicine, has suffered deeply from bad logic, from the very deficiencies that arise out of its failure to appreciate the quality and limitations of the cognitive instrument, the human mind. It is indeed rather sad that science, which prides itself on the exacting calibration of its instruments, has largely failed to calibrate its master instrument, human reason.

In his excellent monograph, *The meaning of disease*, William A. White has aptly said: "In all this mad rush for the discovery of new facts by the analytical method and by the use of an ever-refined technique, there is one workshop, one laboratory, so to speak, that is sorely neglected—I mean the workshop of the mind, the laboratory in which the equipment is ideas and intuitions and the processes thought processes" (3).

But, lest we become lost in vermiculate questions, I will not press this indictment further but will rather let it issue, as it will, from the scrutiny of the concept of the specific in medicine.

At the very start, however, we must recognize that in medicine the term "specific" has been most commonly taken to mean some therapeutic agent having a direct and unique effect in a given disease. We think, for example, of quinine as a specific in malaria, of mercury in syphilis, and of ipecac in amebiasis. In such uses, "specific" is a substantive term referring to some agent having unique therapeutic qualities. There is, however, another usage of the term "specific," one that embraces the therapeutic, but extends beyond it. *That* usage treats the term in its qualitative or descriptive sense. It is in this second, larger sense that I intend the word "specific." Perhaps "specificity in medicine" as an alternate title would help to make the theme of my paper more clear. In actuality, however, as you will see shortly, it is not specificity as such that we encounter in medicine, but *the specific* in nosology, in aetiology, and in therapy, and it is this very concept of *the specific* in nosology, in aetiology, and in therapy, that I desire to scrutinize; for I have a conviction, which I submit to your judgement, that the concept of the specific in medicine, whenever it dominates in medical theory, deleteriously affects its practice and retards its further development.

It is very interesting to observe in scanning the history of medicine that this matter of the specific has troubled and occupied the very best and the keenest intelligences. During the last twenty-five years, however, very little of a polemical nature has been written on this question, so completely have the specificists gained the ascendency. However, the stirring developments which we are witnessing in medicine, the great growth of our knowledge in nutrition, (including the vitamins, and the mineral salts), in endocrinology, and in psychiatry, promise to revive the ancient controversy on specificity, and to set upon the throne once again that more catholic concept that was favored by Hippocrates.

We do, indeed, encounter this matter of the specific in medicine first in the writings of Hippocrates. In the book on *Ancient medicine*, Hippocrates contends that, "Whoever having undertaken to speak or write on Medicine, have first laid down for themselves some hypothesis to their argument, such as hot, or cold, or moist, or dry, or whatever else they choose, (thus reducing their subject within a narrow compass, and supposing only one or two original causes of disease or of death among mankind,) are all clearly mistaken in much that they say" (4).

Hippocrates prefers rather to regard disease as the resultant of a dyscrasia among the elements composing the body; a dyscrasia which could be brought about by a multitude of forces and conditions, by any and all indeed that are included in place and regimen. Hippocrates was a pluralist, rather than a monist in aetiology, and the same broad catholicity is to be observed in his nosology and therapy. His acrid contentions with the physicians of the Cnidian School reveal his impatience with those who would sharply divide diseases and set them up in neat classifications. The broader disease categories he would understand and accept, but in too many instances had he seen disease conditions undergo conversion to set much weight on the too precise "labels." And as to specifics in therapy, Hippocrates seems to have thought but little of them. In *Regimen in acute diseases* Hippocrates wrote: "For my part, I approve of paying attention to everything relating to the art, and that those things which can be done well or properly should all be done properly" (5). The greater portion of this book is devoted to the elaboration of this idea. There are no specific rules of therapy. The competent physician should be guided in treatment by a knowledge of the constitution of the sick, the nature of the disease, the powers of the remedy applied, the time in which it is to be used. Only by taking all these factors into account will the physician "be able rationally to devise the remedy to be applied, and confirm his expectation of it by experience."

There are unfortunately too few of the ancient Greek medical writings available to us to gage how wide and earnest this problem was in the days of Hippocrates. But we can conjecture from his polemical writings, and from certain strictures that are dispersed throughout many of his books, that he was fully mindful of the dangers that reside in the narrowing down of the causes of disease and of therapeutic methods. By the same token, we may conjecture that there was current in his days the equivalent of what we now term the concept of the specific in medicine.

The great inheritor of Hippocratic medicine was Galen. In his day sectarianism, widely divergent factionalism, each with its own brand of specificity, was rampant. The Methodists, the Empirics, the Dogmatics, each advanced their special pathology, solidistic, humoral, and pneumatic, with an exclusiveness that was bitter and uncompromising. Galen, however, in the better tradition of Hippocrates, was eclectic toward the conflicting schools of his age. He mastered and synthesized them, binding them all in the matrix of Hippocratism. With him the catholicism of Hippocrates predominated and reigned for sixteen hundred years. To the extent that medical thought escaped the polluting stream of demonology (in itself a debased form of specific aetiology), it was Galenic-Hippocratism that was transmitted through the Dark Ages to the time of the medical Renaissance, ushered in by Vesalius. This Galenic-Hippocratism was catholic in its nosology, in its aetiology, and in its therapy. This is well reflected in one of the late Galenic-Hippocratic documents, the *Regimen sanitatis salernitanum.*

The fact that this remarkable compendium is not an accredited publication of the School of Salerno but is a collection of dicta long current in southern Italy, does not detract from but rather enhances its testimonial value. It bears witness to the dominance and widespread dissemination of Greek medicine. There is nothing of the specific in the *Regimen*, whose wise injunctions, "Use three Physi-

cians still; first Doctor Quiet, next Doctor Merry-man, and Doctor Dyet," find validation in the best light of our present-day knowledge.

The contest between specificity and catholicity in medicine, though acrid in the days of Hippocrates and Galen, was with the dominance of Galenic-Hippocratism, dormant for the long span of years described as the Dark and the Medieval Ages. The specific in medicine resurges with the Renaissance. In Paracelsus, we find its first quickening. In his scheme of macrocosm and microcosm, disease is endowed with entity.

"Each disease has an invisible body, and is an element of the macrocosm and microcosm and a personage in itself" (6*a*).

No less specific is Paracelsus's concept of the effective remedy. He would indeed diagnose and classify diseases according to the effective remedy. "Do you say this is *morbus sanguinis*, that *morbus hepatis*—who has given you such lynx-eyed vision that you can determine that it is the blood or liver which is at fault? A more genuine, honest physician says this is *morbus helleborinus*, that is *morbus terpentinius*, that *morbus Sileris montani* and not, that is phlegma, this rheuma, that corrhyza, that catarrhus. Not seventy varieties of fevers but as many fevers as there are fever specifics" (6*b*).

We can see from this with what reason Paracelsus is hailed as the Nestor of the specific in medicine. But the influence of Paracelsus on his contemporaries and on the immediate development of medical thought was slight and transitory. The full vigorous development of the specific in medicine was promoted by other more revolutionary events. It drew its strength from the great works of William Harvey, and of Robert Boyle. T. Clifford Allbutt has very aptly observed that "The immediate effect indeed of Harvey's discovery of the laws of mechanics in the field of the animal body was at first to impel men not to common sense, but to a vigorous exaggeration of the new point of view: every function was to be regarded as mechanical; and thus arose the 'iatro-mechanical school'. Under a like impulse, deriving from the chemical discoveries of Boyle and his followers, an iatro-chemical school sprang up" (7*a*).

Boyle directly instigated the pursuit of the specific in medicine. He was the author of a small work entitled, "Of the Reconcileableness of Specifick Medicines to the Corpuscular Philosophy" (8). This is an ingenious work which, though composed in the quaint style of the period, is remarkably similar in its speculations to the theoretical rationalizations of Ehrlich and the present day chemotherapists.

Specificity in medicine—specific nosology, specific aetiology, specific therapy—blossom forth in the seventeenth century. Its leading advocate was Sydenham. Sydenham promoted and advanced the specific in nosology. Diseases to Sydenham were entities, to be observed, described, and classified as the botanist does his specimen plants. The ideal treatment is the specific. And, albeit Sydenham professed to know but one, Cinchona, yet he firmly believed that other therapeutic specifics exist, unbeknown to man, but discoverable through persevering search.

Sydenham is called the English Hippocrates. This noble title seems unreconcilable with his specificist views. But Sydenham's genius was protean. Consistency was not among his virtues, and he labored better than he taught. In actual practice, he was catholic.

That which was useful was acceptable in his armamentarium. He opposed the iatro-chemists and their fine-spun theories. Despite this, however, Sydenham must be counted among those who contributed largely to the promulgation of the idea of the specific in medicine.

From this period on, the concept of the specific flourishes wildly. In the eighteenth century, largely as a result of the impetus of Sydenham, nosography developed quite along the lines of botanical classifications. In 1763, François Boissier de Sauvages published his *Nosologia methodica*, in which 2400 kinds of disease are neatly classified. Each disease was accorded a definite and specific locus such as might be given to a plant specimen (9).

At this time, too, the specific in medicine acquired a new tangent in Morgagni's great work, *De sedibus et causis morborum* (1760). With this epoch making work, there began the great search for the *seat*, the specific locus of disease. Bichat advanced this quest by his studies in histopathology, and the apogee of this development is seen in the following century in Rokitansky. It was Rokitansky who affirmed that pathological anatomy contains all there is in medicine of positive knowledge (1846). In the realm of aetiology, too, the eighteenth century witnessed a flourish of specifics. In the stead of the Hippocratic dyscrasia, we find advanced such simple specific explanations of disease-causation as Hoffmann's "spasms and atonies," Cullen's "nerve pathology," John Brown's "sthenic and asthenic," Broussais' "bloody" gastroenteritis, and Johann Kampf's "doctrine of the infractus," by which he intended nothing more than impacted feces. In each instance, the therapeutic rationale and practice was no less unique and specific than the theory on aetiology.

It is common among medical historians to castigate this period and its chief actors. To Garrison, eighteenth century medicine is "dull and sober sided." Stahl is characterized as "a stiff necked, bigoted pietist," and Brown as "disputatious and disreputable." Such judgements are illiberal. These men were the legitimate heirs of the preceding generations of scientists; their theories and systems were the logical developments of the preceding ones. If the Cartesian picture of the human body as a machine be accepted as valid, and it was so accepted, why not then conceive of disease as an embarrassment of the machine in some portion of its working parts. It may be in the blood, or the nervous system, or the musculature, or the gastrointestinal tract. The theories are logical enough. They are founded, it is true, on a restricted foundation of knowledge, but they share the spirit of the age, which was crudely mechanistic. Always we find that when the mechanistic view-point prevails in the biological sciences, medicine is specifistic in its nosology, aetiology, and therapy.

During the eighteenth century, we witness the rise of physiological study and thought. In 1757–66, there were published the eight volumes comprising the *Elementa physiologiae corporis humani* of Albrecht von Haller (1708–1777). This monumental work had no influence on the contemporary medicine (10). "Haller in the eighteenth century always seems to . . . have been something of a *vox clamantis*" (7*b*). But in the following century, the nineteenth, physiological medicine arose to challenge the specificist schools of thought. Its outstanding champions were C. F. Wunderlich and Rudolf Virchow. Wunderlich, together

with Roser, founded in 1842 the *Archiv für physiologische Heilkunde*. In the first number of this publication, Wunderlich sounded the battle cry of the Physiological School. It was for the realistic, i.e., physiological, study of the problems in medicine and against the specificists in ontology, aetiology, and therapy. Ontology, Wunderlich wrote, "takes abstract concepts for things, implying their actual existence and at once treating them as entities." The motto of the school was "dynamic comprehension—not static description." "Knowledge is important but understanding is more important and higher still."[1]

Virchow joined in this attack upon ontology and specificity, supporting it with all his dialectical skill and vast knowledge. In 1849, he published his *Die Einheits Bestrebungen in der wissenschaftlichen Medicin* (11*a*) and in 1854, his masterly polemic *Specifiker und Specifisches* (12).

In the first, he presented a penetrating analysis, based upon an historical survey of biological knowledge, of the defects in ontological and therapeutic specificity. In his later polemic, he attacks the specificists and their contentions with vigor and devastating logic.

"At all times," Virchow wrote, "the development of medicine suffered two impediments—Authoritarianism and System" (11*b*). The essential danger in the creation of medical systems lies in this, that while the system attempts to embrace and classify the similar and related, all too often the effect is to create artificial categories, and to do violence to the singular instance, which failing to fit into the system is rejected and suppressed. Virchow pleaded for unity in medical theory and practice; not for specificity but for catholicity. The apposition of pathology and physiology, of humoralism and solidism, of health and disease, he contended, was the creation of contentious, narrow, and illogical thinkers. "The destruction of the ontological conception of disease," Virchow wrote, "leads also to the destruction of ontological therapy, the School of the Specificists. Therapy is confronted not by diseases but by conditions; everywhere we deal only with alterations in the 'life - circumstances' (*Lebensbedingungen*)." To Virchow, disease was but the orderly manifestations of given, and in themselves entirely normal, vital phenomena, under uncommon circumstances and with simple quantitative variations.

The physiological medicine of Wunderlich, and Virchow's sustained aggression against the specificist had their telling effects on medical thought. Their influence, however, was soon devitalized by the phenomenal development of bacteriology. The bacteriological discoveries of Pasteur, and of Robert Koch, the development of vaccines, and of immune sera, cast the teachings of Wunderlich and Virchow into a deep shadow. In bacteriology, the specificists achieved their greatest triumph and vindication. Here was specific nosology, specific aetiology, specific therapy. All that went before was but so much obscure, groping, and arid speculation. How keenly this triumph was relished, how complete the victory was thought to have been, is amply revealed by von Behring in the introduction to his *Gesammelte Abhandlungen zur ätiologischen Therapie von ansteckenden Krankheiten* (13). The whole of this chapter, counting seventy-one pages, is devoted to the vindication of the specific in medicine in the light of what sterilization, immunization, and blood serum therapy

[1] "Das Kennen ist wichtig, aber das Begreifen ist das wichtigere und höhere".

did and further promised to achieve. Behring not only fixes his faith firmly on what he terms aetiological medicine, the newer label for the specific, but affirms that all efforts directed toward improving the health of the living organism or toward raising its resistance, is bound more often to lead to harm than to the desired ends. As we ourselves have witnessed, the triumph of the specific was complete. Bacteriological thinking, and all it implied, dominated and still dominates medicine. The protests of such men as Pettenkofer and Ottomar Rosenbach went unheeded. Courageous, indeed, was the man who ventured to question whether in the infectious diseases, the specific aetiological agent, the germ, summed up all there was to the aetiology of the disease. Osler might suggest, as he did in relation to tuberculosis, that the soil was no less important than the seed, and Klebs, as late as 1911, complained that our bacteriological knowledge so dominated all medical thinking that hardly any one ventured to inquire whether there may not exist other disease causations. But Osler and Klebs were very much the exceptions and their words had little influence. To this day, the specific dominates medicine. The latest achievements in chemotherapy are construed by most as additional evidence of the soundness and validity of specific therapy.

Fortunately, there are other ferments operating today in the medical economy. There is our rapidly growing knowledge and appreciation of the rôle of nutrition in health and disease. There is psychiatry and its budding offshoot—psychosomatic medicine. These developments are slowly, but only very slowly, stirring up doubts and questions in the minds of some few, whether specificity has not really been a bane to the medicine of our own generation, as it was to that of former days. To these few there comes to mind that wise observation of Claude Bernard, "That which we know impedes the way to further knowledge." There is no denying that that which is considered the aetiological specific, the tubercle bacillus in tuberculosis, the pneumococcus in pneumonia, is in fact causatively related to the given disease. But, is it the whole cause, or even the major factor in causality? Is it enough to say that *without* the tubercle bacillus there is no tuberculosis, since we cannot contend that *with* the tubercle bacillus there always is tuberculosis? With our minds eye-fixed on the bacillus, have we not been blind to the greater and more important causative factors, and has this not been true in all phases of medicine?

You will recall, however, that I instanced the history of the specific in medicine only to illustrate a somewhat larger theme, that of the dire results which arise from the failure to evaluate the effects of the operations of the cognitive faculty upon the data of science. To this theme I must now return, binding text and illustration to form a cogent whole.

Viewing the matter as we have tried to in historical perspective, it appears that mankind has not gone far in developing the integrative competence of his mind. In his ordinary, and even in his technical thinking, man "runs to unity," not to the transcendental unity which is the dream of the idealist and the objective of the philosopher, but to the arithmetical unity, for which another name is the specific. When, despite the bias of his mind, he is perforce compelled to recognize the complexity of the matters with which he is concerned, man may advance a step and do his thinking on the premise of dichotomies, such as body

and soul, nature and nurture, force and matter, subjective and objective. In his highest speculative efforts, he may attain to trinity. But mostly man in his thinking favors unity. Truth is one; justice is one; righteousness is one. It is twenty-four hundred years since Socrates attempted to expose the folly of this false knowledge, since he urged upon man that his first duty to himself was to know himself—Γνῶθι σεαυτόν.[2] And what else did Socrates intend but that man should study the workings of his own mind, that he might escape the pitfalls of its undisciplined ways. For his trouble, Socrates was served the hemlock cup, and though mankind has repented, and has posthumously crowned him the greatest of its teachers, it is as heedless of his lesson as it was during "the thirty days." The olden warning, "Fear the man of one book," goes unheeded. On the contrary, the man of one book, of one thought, of one idea is nowadays prized.

Look about—do not all the quack healers offer their deluded followers unity and specificity? There is Christian Science with its malicious animal magnetism, and Chiropractic with its spinal subluxations; Abrams had his electronics, and the Naturopaths have their varied specifics. Nor is it in healing alone that the quack is signalized by the specific. In the field of economics, there is the materialist interpretation of history, a theory that charges all the ills of mankind to economic maladjustments, and which promises quite in the spirit of the specific to remedy all human ills by communizing the means of production and distribution. In statecraft, we have the nostrum of the corporate state, in sociology, that of the "pure race." More perhaps than at any other time in history, specificity is rampant in every phase of human thought and endeavor. Man has become the victim of his own bent to reason in terms of the one—to prize the specific.

The distressing circumstance is that in denying the sweeping pretensions of the specific, one is exposed to the charge of denying the very existence of that which is called a specific. "Would you then argue away all the germs, and the vaccines, and the serums, and the chemotherapeutic agents?" the challenge runs. Not at all. The intent of the argument is that the claim of the specific takes in too much terrain, that it impedes understanding, and effective dealing with the larger and more important phases of the problem. Nor does the rejection of specificity commit one to a bleary-eyed and indiscriminate eclecticism, to a timid and perpetual loitering on the threshold of orthodoxy. The rejection of the specific carries with it a higher obligation, the obligation to appreciate in full the complexity of the universe we live in, of the problems that confront us; and to deal with them accordingly. We must be on the alert against the simple and all too reasonable account; against the easy and facile solution, even though to all appearances "it works." Perhaps, the beginning of wisdom in this respect lies in being mindful ever and always of the tentativeness of that which comes to us as a scientific fact. In his *Logic for use*, F. C. S. Schiller has most ably stated the matter thus (14):

> Science is said to have unbounded respect for fact, to be devoted to its study, to lead to a loyal recognition of fact as the finest fruit of scientific training. Such fact is to be a pure *datum*, abolutely *given* and in no way *fabricated*. We are to have no say or choice about it, and to have done nothing to make it fact. Nothing *faked* is to count as *fact*.
>
> But how does this ideal itself accord with the

[2] *E caelo descendit* Γνῶθι σεαυτόν *Figendum et memori tractandum pectore* (Juvenal, *Satires* xi–27–8).

actual? The 'facts' the sciences have accepted at various stages of their career have been very different. At best they have been ephemeral, more often they have turned out fancies, fictions, fakes, fallacies, errors, superstitions, delusions—everything, in short, that is abhorrent to the scientific soul. From this condemnation only the reigning facts are exempt, to which we (rightly) pin our faith because they are the best we have; but in the light of their history must we not admit that sooner or later they, too, are fated to be superseded like the rest? And what is to be done about it? . . .

The sciences, like the theologies, are human enough to try to conceal their difficulties from the uninitiated, and by a lavish indulgence in technical nomenclature they often succeed. Another favorite expedient is to institute a Draconic purge of 'facts,' and to endeavor to find a fact which shall be, like Caesar's wife, above suspicion, so hard and solid that it can be trusted to stay fact, come what may . . . .

Every science must admit that its 'facts' have undergone progressive transformation, and seem bound to change further as its knowledge grows: nor need it hesitate to admit that the facts as they appeared at the beginning and as they turn out to be at the end of an inquiry may often differ *toto caelo.*

Besides the tentativeness of the facts of science, we must also appreciate their essential relativeness. The progression of knowledge, in so far as it is advanced by research and experimentation, is achieved by the fragmentation of large problems into their elementary component parts. When research and experimentation is successful, we gain insight into the essence of that fragment with which the research and experimentation was concerned. We learn with "tentative absoluteness" the meaning and significance of that fragment of the larger problem which we studied. But our best knowledge of this fragment is never more than relative to the whole problem of which it forms a part. It is a cardinal fault to extend the application of our knowledge of the part, and to hold it valid for the whole. This fault lies at the root of the concept of the specific. Again, a true knowledge of the whole is not gained by a simple summation of our knowledges of the parts. The data yielded by our research and study must be, so to say, metabolized, and in this our cognitive faculties play their vital rôle. These faculties have a distinctive physiology with which we must be fully acquainted if we are to exploit them best in the achievement of an adequate knowledge of the whole. Unfortunately, we have in recent years largely lost sight of all these matters. We appear to have assumed that effective and correct thinking is a competence that comes to man as spontaneously as the competence to walk or to see. We seem to labor under the conviction that by some innate affinity miscellaneous knowledge will of itself shape and orient itself into higher and broader comprehensions without our deliberate intervention. Given sufficient knowledge, we seem to believe wisdom will come of itself. But it doesn't. Though today our knowledge is greater than it has ever been before, our wisdom is weak and unavailing. How much of this is due to our neglect of the cognitive function—in favor of the sense data? How much of this is due, in other words, to bad thinking?

The historian maps time and events, as the cartographer the lines and contours of the earth, with an incisiveness and neatness that nowhere is matched by the actual reality. Yet, maps render a very useful service to those who need orientation. I am aware that much of what I have "sketched" distorts the reality which it pretends to represent. Yet I hope and believe that it sufficiently approximates actuality to orient us in our review of this significant matter. I trust also that because we have dealt with our theme at arm's length, the impression is not gained that it belongs to

the sphere of speculative abstractions, high, rare, and cold, like the Northern Lights. I beseech you rather to consider it approximate to the bedside—at the elbow of the clinician ministering to the sick.

These considerations are likewise of equal, if not of even greater significance, to the workers in public health. These men, more than the clinicians, confront the problem of disease in all its manifold complications. Even less than the clinician can they afford to restrict their thinking and their work to the narrow limits of the specific.

In conclusion, one final note: no one will construe our condemnation of the concept of the specific in medicine as an indictment of those who through their genius and labors have added so richly to our factual knowledge and to our diagnostic and therapeutic competence. For that much of their service to medicine and to mankind, we must and do honor and esteem them. It is only where they have transgressed, and upon their sound facts built false theories, that we are obliged to challenge them, and to correct them. This we do with humility, knowing that if we in any way see further than they did and better too, it is because we are the beneficiaries of that patrimony which their rich lives and arduous labors created for us. We thus labor in the spirit of our fathers, who no less than we subscribed to the dictum of Galen ὅτι ἄριστος ἰατρὸς καὶ φιλόσοφος (that the best physician is also a philosopher).

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# "Your Aged Friend and Fellow Servant, John Redman"

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When John Redman (1722–1808) became the first president of the College of Physicians of Philadelphia, he was sixty-four years old and already alluding to his age and infirmities. Nevertheless, he played an influential, if somewhat retired, part in the medical affairs of the city for twenty-two years more, during eighteen of these years as president of the College (elected annually and with never an imputation of dictatorship).

A reading (for another purpose) of Redman manuscript material in the library of the College, and of his few published addresses, rather forcibly projected an interesting aspect of his character that hitherto has been only hinted at, and that might reasonably be more fully documented. It would appear that in the score of years which comprised his long twilight this eminent physician developed a more or less fixed attitude toward himself which might be thought, in the nature of things, to have influenced that of others toward him.[1]

In his inaugural address,[2] Dr. Redman, then sixty-four years of age, refers to himself as follows:

> . . . Being not used to speak in public, I must beg leave rather to read it [the address] than attempt to pronounce it from memory, which, at my age, is not much to be depended on . . . . After such a view I said it would be vanity or arrogance in me not to suppose that my election was more owing to the generous benevolence of your own minds, as a mark of respect to my age and long standing in the profession . . . and if you live long enough you will all be convinced by experience (as I am already) that old age, even in its commencement, partakes more or less of them both [infirmities and diseases].

Five years later, May 13, 1791, Redman was writing to an unidentified woman friend as follows[3]:

> . . . and had not my memory (now grown very slippery) faild me in my hurry . . . For however you may suppose kindly (as I know you wish it) that my powers may not be so much weakend as I imagine—I feel myself really incapable of writing a

[1] One recognizes readily that it is well to use extreme caution in offering, or accepting, as evidence statements removed from their context, or isolated statements that could easily be countered by others. The passages quoted below, however, excerpted, in most cases, from lengthier documents, are clearly not dependent upon their several contexts; and the number of them, occurring over a period of eighteen years, points them out as being thematic rather than isolated.

[2] The date of its delivery is not known, but is assumed to be in December, 1786. The address is printed in W. S. W. Ruschenberger's "Account" of the College in the Centennial Volume (1887) of the *Transactions of the College of Physicians of Philadelphia*, pp. 179–183; the "Account" also appears as a reprint, Phila., 1887. One might wonder that in their first volume of *Transactions* (1793) the College published Rush's "Discourse" on the objects of the College and not the inaugural address of their president, if Redman's address were not known to be the characteristically intimate document that it is.

[3] *Gilbert collection of ms letters*, vol. 3, pp. 363–4.

letter of almost any kind to my own satisfaction, and take much longer time to do it in / even badly / than formerly ... Is it not pride that makes you [i.e., one] fear being degraded in the opinion of others as to intellectual powers, tho' really true, & arising from natural infirmities of age or disease? ... As to my bodily health I thank God it is as good if not better than most of my age, except weakness in my muscular strength, especially that of my legs, and yet active eno' too, & even alert (in ye forenoon especially) if not continued very long at a time. My senses also are not bad except my hearing.... But my mental powers have certainly faild, not only naturally by age, but still more so (at least faster I believe than they would have done) by the Influenza, especially as to memory and recollection, and a certain disagreeable confusion in my head if hurried, in writing or attempting to act much in business, or more than one thing at once, or even that in haste. These I felt very much for a 12 month after that disorder, so as to oblige me often to apologize for the shortness of my letters and even their triflingness, to my own child ... But still far from being so well in those respects as I believe I should have been, had I not experienced the bad influence of that same influenza.... Your Real Old friend & Respectful Hble Servt.

In July of the same year, 1791, Dr. Redman, at the age of 69, was reëlected as usual to the presidency of the College, and on August 2 delivered an address of thanks, from which the following is taken[4]:

Having by indisposition of body been prevented from joining you at your last meeting and annual election ... I now take the first opportunity of returning you my hearty thanks for this renewed instance of your respect, the continuance of which, notwithstanding my infirmities, so evidently increasing with my years, leads me to add, that such kind indulgence toward an aged brother, arising chiefly from the benevolence of your own minds, demands my particular acknowledgements, and under that view gratitude obliges my acceptance of the office again at this time, which, otherwise in regard to myself, I should have wished to decline. For, to be candid and tell you the truth, I should not have been easy under the sense I had of my growing infirmities of body and mind for some time past, to have continued to accept the honor you have so repeatedly conferred upon me, but from the consideration that you always joined a colleague with me as Vice-President,[5] whose eminence and reputation ... clearness of judgment [and] vigor of faculties ... fully obviated and prevented any ill effects, naturally to be expected from declining age ... Nor can I omit congratulating myself on the well-grounded hope I entertain of receiving from the abilities of our new Vice-President [William Shippen] ... that aid and support in my office which my advanced age, and debilitated powers and defective senses make requisite; and which may render my situation the more easy and pleasant while I remain in it, which cannot now be long, as I am persuaded I must soon recede either from prudential choice, or from necessity of another kind, needless here to mention ...

In a letter, dated January 3, 1792, to Dr. Samuel P. Griffitts, secretary of the College, we read[6]:

Tho' I am much better, yet from some pains I feel every night as well as a few stitches in the day time when I go into a cooler air, finding it improper to attempt going out especially in the present state of the weather, and consequently impossible to attend the meeting of College;—I have wrote a few lines [see next quoted passage] by way of apology and expressive of my regards on the present and all occasions, which I beg youl please to deliver ... Tho' not able to go out, I thank God I am as well as I am, and shall always be pleased to see you when convenient ...

Message to the College, dated January 3, 1792[7]:

In addition to my disappointment in not being able to join you at your first meeting in our new apartment,[8] occasioned by a severe attack of the

[4] *Trans. Coll. Phys. Phila.*, Centennial vol. and reprint (1887), pp. 187–9.

[5] John Jones, the surgeon, who came from New York to live in Philadelphia in 1780. He was vice-president of the College from its organization until his death, June 23, 1791.

[6] *Manuscript archives of the College of Physicians of Philadelphia* 1787–1847, p. 197.

[7] *Ibid.*, p. 199.

[8] A room in the hall of the American Philosophical Society, leased from December 10, 1791, until June 10, 1794—the College's beginning as an independent householder, according to Ruschenberger (see n. 2).

Rheumatism in my loins & hips, on the very day of your [last] monthly meeting; which though they were by proper administrations relieved in a few days, so far as to give me hope of being soon restored to my usual health & exercises in the open air, agreeable to my age; and thereby becoming capable of attending your first meeting on the commencement of the new year; I am sorry to be obliged now to inform you, that from the Effects of the first attack, and frequent slight returns of my complaint, I cannot enjoy that pleasure consistent with judgment or prudence, and therefore must be satisfyed with doing myself the honor of offering you my best respects with the compts of the season; and what is better than all compliments, my hearty good wishes for your constant prosperity and success in your Collegiate Capacity & Undertakings; and that each member may abundantly increase in true wisdom & virtue, usefullness and happiness, thro' a long course of time, and when time shall be no more as to us. Be assured also that it yields me no small comfort to feel myself so far convalescent as affords me hopes (if so be the will of a good providence) of yet again associating with you at your next monthly meeting. Till when & ever I am gentlemen with all due Esteem, your very Respectfull Hble Servt.

On September 3, 1793, Dr. Redman presented what seems to be his only professional communication to the College in the eighteen years of his fellowship.[9] And this was, in effect, an historical communication. The College, deeply concerned over the yellow fever epidemic then raging, summoned their elder statesman to give an account, there being none published, of the epidemic of 1762. This Dr. Redman did, "by recurring to," as he says, "and examining the contents of my day-book . . . and by making some enquiries of an ancient woman and others . . ." The College returned a vote of thanks to their president for his "important communication," and many years later (1865) published the account from the original manuscript, then (and still) in the library of the College. Following is the beginning and the conclusion of the 'letter', for so its form characterizes it[10]:

My memory being much impaired by age & infirmities, & especially by a severe & long fit of the Rhumatism the winter before last, affecting at times my head, and also from the effects of a former, & more lately a second attack of the influenza . . . not doubting also their kindly overlooking any defects arising from not having time to correct and transcribe what I have written, or from impaired faculties . . .

The doctor, at 71, regretted his inability to attend the meeting of November 5, 1793, in these words[11]:

I am really much mortifyed that I cannot meet you this afternoon which nothing but so evident a risque of my health as the wet weather occasions should have prevented . . . I am gentlemen your aged fellow Servt . . .

He was present, nevertheless, at special meetings on November 12, 19, and 26, and at fully half of the meetings in 1794 and 1795. On January 3, 1796, Dr. Redman (age 74), foreseeing that he would be unable to attend the meeting on January 5, wrote the College on a matter of business, concluding his letter as follows[12]:

. . . I am sorry that I am again prevented from meeting you, but imperious necessity from infirmities must be obeyed. Whatever the College shall think proper to be done . . . their orders on notice from the secretary shall be punctually complyed with—by their aged Friend & fellow servant . . .

In August, 1797, Governor Mifflin was informed of a new outbreak of fever in Philadelphia and wrote Dr. Redman,

[9] The only recorded publications by Redman in his life-time were his Leyden (1748) inaugural dissertation, "De abortu", and a 'defence of inoculation' published "about 1759". Though the latter is frequently referred to in biographies of Redman, I have not been able to locate a copy; it seems not improbable that it appeared in one of the Philadelphia newspapers of the time.

[10] Transcribed from the manuscript.

[11] *Ms arch.*, p. 243.

[12] *Ms arch.*, p. 305.

as president of the College, requesting information and advice concerning it. Dr. Redman replied (August 16, 1797) that, on receipt of the Governor's letter, he had immediately summoned a meeting of the College and that their report would be communicated to him as speedily as possible. The letter closes with these words[13]:

> ..With all due respects I am Sir Your aged friend, and fellow servant, in the cause of humanity, and the community...

Though Dr. Redman was more often absent than present at the meetings 1798–1801, he was reëlected annually and his name is affixed to numerous documents, many of them attesting the College's activity in matters concerning the public health. He attended the stated meeting on October 6, but not those on November 3 and December 1, 1801. A letter to the College, dated November 30, 1801, informs the College of the reason for his absence from the meeting scheduled for the following day[14]:

> ...I am sorry to be obliged to add, that a kind of spasmodic asthma which seiz'd me 2 weeks past & has confind me at home ever since, prevents my having the pleasure of attending our stated monthly meeting, as I really wished and intended; For though it affects me chiefly in the night, and am much better, it has renderd my pectoral organs easily liable to catarrh, and therefore improper to venture out yet, even in day time, especially near Evening; which I hope will be deemed a reasonable & sufficient apology for your aged, and respectfull friend & President...

In 1802, Dr. Redman (age 80) attended only the stated meetings in June, September, and December. But through Thomas Parke, then one of the censors and, later, president (1818–1835), he sent an undated letter of explanation which was read, according to a notation on it, at the meeting on August 3[15]:

> The purport of this is to request you to inform the College of Physicians, that at their last Election meeting, I was confined to my Bed with severe Rhumattic complaints in my lower limbs, (preceeded by a cholera morbus with spasms in my legs for 2 or 3 days & nights) which continued near two weeks, and weakend me so far as to make walking soon fatiguing to me ever since, and has prevented me from going out only a little in the middle of the day. Nevertheless I fully intended attempting to do myself the pleasure of meeting with them this Evening, were it only for a short time, to make my acknowledgments, for the honor they have done me in rechoosing me their president, though so incapable, from increasing infirmities, of performing the duties incumbent, with that regularity I could wish; but I found from my own debility, or the dampness of the air, (perhaps both) myself so much fatigued in only walking to your house, that I fear to attempt it so near Evening; and therefore must beg the favor of you to present those acknowledgements, for me... and thereby oblige your Real Old, and Respectfull friend &ca...

Dr. Redman's last appearance at a meeting of the College was on August 2, 1803, a month after he had been reëlected to the presidency for the seventeenth time. The library's last Redman letter is dated July 2 (postcript, July 3), 1804. In it, Redman, who was then in his eighty-third year, sought to withdraw his name from consideration in connection with the annual elections to be held at the meeting on July 3[16]:

> Though I feel it a pleasant, as well as an Incumbent duty, to render you my sincere, & gratefull acknowledgements, for the Honour conferred upon me, by Electing me to the Presidency of the College of Physicians of Philadelphia, from its comencement successively; and especially for the generous indulgence manifested toward me, in continuing my Election the last 2 or 3 years, tho' from the infirmities of age &ca I was unable to perform the requisite duties of that station, either very punctually, or seasonably; which demands my special

[13] *Gilbert col.*, vol. 3, p. 365.
[14] *Ms arch.*, p. 411.
[15] *Ms. arch.*, p. 413.
[16] *Ms arch.*, p. 431.

thanks, both as evincing a liberal & respectfull attention to me, in consideration of my being the oldest physician remaining among you in this my native city; and also affording to my own mind in the decline of life, the solacing gratification to hope & believe on such good grounds, that my conduct both in the profession & practice hath been free from, & unstained by, at least any material Improprieties: yet I find it equally Incumbent on me to Inform you, that since the New Year commenced, and the close of my 82d soon after, I have experienced such a translation of my long habituall Rhumattic, or Arthrittic complaints from the Inferior extremities to my head & breast, as together with a rapid increase of the infirmities natural to old age, hath occasioned so much debility, not only in my muscular & nervous system, but also impaired my mentall faculties so far (at least in my own apprehension) as to render me in a great degree incompetent to some of the essential duties of that important station, in which your benevolent indulgence hath continued to place me for so many years past. I therefore deem it a duty I owe to you, the public, & myself, very earnestly to request that you would on the present occasion, withhold that indulgence (if such was your intention to repeat it) and bestow your suffrages for that honorable office, on one more proper, & adequate by health of body, and vigor of mind, & every other requisite qualification; of which characters, I am happy in well knowing you have so many among you, & hoping you ever will. And now gentlemen—To conclude, I have only to add, That as I shall ever esteem it one of my highest honors to have been your president, and only equall'd by my having enjoyed the priviledge & happiness of being employed above 25 years in another publick institution,[17] devoted like your own to the cause of humanity, & the diminution of human misery; so shall I also deem it highly reputable to be still counted among the members, (& found faithfull as far as my capacity will admit) of so honorable and important a body as the College of Physicians of Philad'a—whose progressive increase in fame utility & dignity, justly merited, & constantly obtained, by an exemplary philanthropy, and by wise & vigorous exertions in *relieving the painfull distresses* [Redman's italics] of our suffering fellow mortalls, (while I am continued a living witness thereoff), be assured—my much esteemed colleagues—will yield a greater gratification than most other things in this world, to the declining years of your much obliged, respectfull friend, & fellow servant in that *good work* [Redman's italics].

P. S. I had some thoughts of sending this to you at yr last monthly meeting, with a formall resignation; but being then in a situation rather unpleasant to write; and moreover somewhat apprehensive, that a vacancy might happen in another way: on further consideration I judged it more respectfull to you, to continue in the office, till the expiration of the Time, for w'ch I was elected, if providence permitted.

The College heard the letter—and promptly reëlected their venerable colleague to his accustomed office, directing the secretary, as the minutes tell us, "to write a letter to Dr. Redman expressing the respect and esteem the College bear to Dr. Redman, and announcing his re-election as President of the College."

Middleton[18] has referred to Redman's "habitual self-abnegation". The passages quoted above suggest that he enjoyed the most highly perfected 'inferiority complex' to be discovered among the distinguished medical men of his day. The infrequency with which this attitude is met among the eighteenth century physicians, and the eminence of its possessor, lead one, briefly and inadequately though it be, to inquire into its origin.

After courses of study at Edinburgh, Leyden, London, and Paris, Redman returned to Philadelphia about 1750 "with a medical training far surpassing his most favored townsmen."[19] His practice soon became larger than he could well handle; he taught medicine under the preceptorship system; he held a hospital appointment, trusteeships of, and memberships in, various medical and nonmedical institutions—in short, his career

[17] The Pennsylvania Hospital, which he served as physician, 1751–1780.

[18] Middleton, William Shainline, "John Redman", *Ann. Med. Hist.*, 1926, 8, 213–223.

[19] Middleton, *op. cit.*, p. 217.

was in most respects similar to that of the eminent physician of our own day. Is it not strange that a man so active and successful should, at the age of sixty-four, allude to his age and infirmities, and continue so to do for eighteen years?

Several factors, however, help to explain Redman's repeated references to himself as an aged man at a time of life when men of our day have often scarcely begun to react to the stresses of an arduous career. First, of course, is the difference in life-expectancy then and now. We have to remember that, incredible as it may seem, the life-expectancy in this country at the end of the eighteenth century is surmised to have been only about 35 to 40 years.[20] Under such conditions, one might justifiably, at sixty-four, not only refer to himself as an old man, but actually feel and be one.

Secondly, though the eccentric Abraham Chovet, a co-founder with Redman and others, was eighty-two when the College was organized,[21] the average age of the other senior founders was forty-seven—leaving Redman a rather more than technical seniority. This seniority was further emphasized by the fact that many of Redman's brilliant younger colleagues, such as Morgan, Rush, and Wistar, had first studied medicine under himself; and had, with others still, such as Shippen and Jones, achieved rather greater national prominence in a shorter period of activity.

A third factor which might easily have increased Redman's consciousness of age was his uncertain health. "At forty years of age [1762], Redman suffered from a subphrenic abscess, which, rupturing intrathoracically, was discharged through the bronchi. Subsequent to this primary illness there were frequent periods of incapacity throughout his long life.[22]" The nature of Redman's maladies during some of these periods we have just had rather vividly described in his own words. It is certainly not impossible that maladies of this sort, united with acute consciousness of age and with native modesty, should develop in one a mildly neurotic attitude toward his age and infirmities. "Is it not pride that makes you fear being degraded in the opinion of others as to intellectual powers, tho' really true, & arising from natural infirmities of age or disease?"[23]

While consciousness of age and infirmities is, of course, not rare among those who bear them, it does not often manifest itself, in the normal, so vigorously and thematically. Most striking, perhaps, of Redman's consciously or unconsciously psychological uses of his age is to be found in the 'complimentary close' of his letters, a specimen of which appears as the title of this communication. It would be a hard heart, indeed, that would not warm to one who described himself as "your aged friend", or "your real old friend". The two allusions to the writer's "apprehension" of a natural termination of his tenure of office, one voiced at the age of 69, the other thirteen years later, are certainly no more calculated to lessen the ties that bind. It is difficult, furthermore, to accept unconditionally the frequent general allusions to, and detailed descriptions of, failures of the mind and body. One notes with interest that the final letter, written in Redman's eighty-third

[20] Dublin, Louis I., and Lotka, Alfred J. Length of life; a study of the life table. New York, Ronald pr., cop. 1936, p. 54.

[21] Chovet is not named in the minutes as having been present at any of the meetings.

[22] Middleton, *op. cit.*, p. 222.

[23] Letter dated May 13, 1791, quoted above.

year, shows no decline in length, substance, or rhetorical style; the last sentence of the main body of it, in fact, may well defeat those who did not early go to bed, as Redman probably did, with Cicero.

One is tempted to speculate whether this sedulously cultivated image of himself as an aged and infirm patriarch did not also contribute, along with his eminent qualities as teacher and physician, and as a man *integer vitae scelerisque purus*, to Redman's ability to maintain for so long the robes, at least, of power. Man is the only one of the animals (so far as we know) that takes easily to veneration, if not to venerability. A venerable image, especially if it be so labeled, easily inspires veneration in men of good will. One wonders what Redman's long twilight would have been like, had he been a man of strong personal reserve, absenting himself with only such bare excuse as courtesy demands, wearing age and infirmity soundlessly.

Did Dr. Redman's younger colleagues, his "professional children" (to use another of his benevolent terms), listen with filial interest, or with professional interest, to the reasoned catalogue of his ills—and reëlect out of sympathy and kindness? Were the venerable president's services still sufficient to the College's needs, despite his own protestations? Did fundamental conservatism play a part? It seems likely that all combined to ensure for their first president the second longest presidential tenure in the history of the College.[24]

Dr. Redman was elected to his nineteenth term, as we have seen, in July, 1804. He attended no further meetings of the College and, so far as we know, addressed no more communications to it. The minutes record that a year later, on July 2, 1805, William Shippen was elected president of the College; there is no mention of their still-living first president. Redman lived on until March 19, 1808. His successor, Shippen, died four months later, July 11, at the age of seventy-two. After the death of Shippen, a special meeting was held (July 25), at which it was "unanimously agreed that an Eulogium in commemoration of his [Shippen's] character and medical services be prepared and delivered before the College by one of their members." The minutes do not contain even the briefest mention of the death of their "aged friend and fellow servant, John Redman."

[24] George B. Wood had the longest tenure, 1848–1878.

# Memoir of Thomas Rundle Neilson, M.D.*

*By* Louis H. Mutschler, M.D.

Dr. Thomas Rundle Neilson was born October 29th, 1857 at 325 South Twelfth Street, Philadelphia, where the family had resided for a period of seventy years. He died after a brief illness in the Bryn Mawr Hospital October 25th, 1939, four days before his eighty-second birthday.

Dr. Neilson was an admired and respected fellow of this Society, a skillful and experienced surgeon, a revered and cultured gentleman of the old school. The College, which he served as president from 1922 to 1925, has suffered a great loss in his passing.

The doctor was of Scotch-Irish descent, his paternal grandfather, Robert, being born in Strabane, northern Ireland, and his paternal grandmother in Londonderry, Ireland. Robert Neilson was made Governor of Trinidad, British West Indies, under the English Crown and Doctor Neilson's father was born on that island during his father's term as Governor.

His maternal grandfather was William D. Lewis, one time Collector of the Port of Philadelphia, and his maternal grandmother was Sarah Claypoole. The doctor was the fourth of seven children of Thomas and Sarah Claypoole Neilson. The family consisted of William, Robert Henry, Sarah, Thomas Rundle, Lewis, Emma Florence, Mary Alice and Frederick Brooke. Of these children only three survive—Lewis, former vice-president of the Pennsylvania Railroad, Emma Florence, and Mary Alice.

* Read at the Business Meeting of the College, January 6, 1941.

When Doctor Neilson's father was a small boy his parents brought him to Philadelphia, where the family has since resided. The doctor married Louise Fotterall and one son, Thomas Rundle, Jr. was born to them. The Episcopal Academy was at one time located in Juniper street and the doctor attended and graduated from this well-known school. He graduated from the University of Pennsylvania, in Arts, in 1877, after which he entered the Medical Department and graduated in 1880. It was his boyhood ambition to become a surgeon. He began his internship at the Episcopal Hospital in 1880, at which time there were but four internes. In 1886 he was appointed surgeon of the staff, which position he held continuously until his resignation in 1924 after forty-four years of faithful, active service to the hospital, a period of service that has never been equalled at the hospital. When Doctor Neilson's name was mentioned for appointment as surgeon to the hospital, one of the managers remarked that he considered him too young for such a responsible position, to which another manager replied, "I think he will outgrow the objection". At the time of his resignation in 1924 he was appointed Surgeon Emeritus of the hospital, which honor he held until his death.

In 1907 the doctor was elected president of the Medical Board and was still active when taken ill. He rarely missed a meeting and the last letter he wrote was one of regret that he did not feel able to attend the October meeting.

His judgement and advice were most helpful and constructive.

During his early days of service to the hospital the automobiles and electric cars were not in use and it was his custom to make the long ride to the hospital in the horse-drawn cars. He rarely failed to respond to calls, no matter at what time they might come, and they often did on cold, stormy, winter nights. I recall seeing him bundled in heavy overcoat, muffler and galoshes arrive at the hospital to examine and often to operate on some emergency case. He was always deeply interested in his cases, studying them most thoroughly and personally dressing the most critical cases rather than have the resident take the responsibility. He was an exceptionally clever diagnostician and was called in consultation by such eminent men as Dr. John B. Deaver and Dr. William Osler.

He was kind and gentle to his patients, often calling them by their first names and frequently giving them a nick-name, as was his custom with his friends and associates. In the operating room he paid strict attention to asepsis and technique. He was a skillful operator, quick and careful, and his thorough knowledge of anatomy enabled him to meet and cope with any emergency that might arise. Rarely did he speak crossly to his assistants or nurses and his quiet manner, kindness and sympathy endeared him to all those who had the good fortune to work with him. The hospital sustained a great loss through Doctor Neilson's death and the Board of Managers, in recognition of his long and faithful service, passed a resolution and ordered it spread upon the minutes and a copy sent to his son, Thomas, Jr. Following is an abstract of the resolution:

Any institution which has had the thought, interest and services of a man such as Doctor Neilson over such a long period has been fortunate and we, the present Managers of the Episcopal Hospital, wish to spread upon these minutes our sense of appreciation of the part Doctor Neilson took in making the hospital what it is today.

The following is an abstract of the minutes passed at a special meeting of the Medical Board held October 26, 1939:

He was a surgeon, safe, skillful and seasoned; a scholar both as a teacher and a student; an associate who had neither rancor nor jealousy; a man with faults as lovable as his virtues were great. We here record that we have lost a keystone. Thomas Rundle Neilson is a luminary in the annals of our history.

The high esteem in which Doctor Neilson was held by his associates is elequently expressed in the following letter from Doctor William Pepper, Dean of the Medical Department of the University of Pennsylvania:

Thomas Rundle Neilson graduated in Arts in 1877, Medicine in 1880; two years later he became demonstrator of Anatomy; in 1884 he became demonstrator of Surgery and in 1885 Instructor of G. U. In 1901 he was made Clinical Assistant Professor of G. U. Diseases, then Clinical Professor, and in 1912 Professor of G. U. Surgery. In 1923 he retired on account of age. He taught in the Medical School 41 years and was Emeritus Professor for 16 years.

He was recognized as an authority in his specialty, an able teacher and clinician and his retirement from active participation in the affairs of the Medical School and Hospital was a distinct loss to our School.

Doctor Neilson was a well beloved member of our faculty. His kindly and genial nature, his sense of humor and his spirit of comradeship endeared him to all.

While in college, Doctor Neilson showed much interest in cricket, which was at that time a popular game. His mother's summer home was at Florence, New Jersey, on the Delaware River.

He there learned to row and, becoming quite an expert, he frequently competed in races on the river. Next to surgery his greatest interest was music. He was an organist of marked ability, having been a pupil of David Wood, the blind organist of St. Stephen's Church and recognized as one of the outstanding organists of the country. Doctor Neilson's devotion to his work precluded his acceptance of a regular appointment, but he frequently substituted for the regular organist. He composed the music for one of the Easter hymns which was sung by the St. Stephen's choir.

Doctor Neilson for a period of years was surgeon to St. Christopher's Hospital. He was a fellow of the American College of Surgeons, the Philadelphia Academy of Surgery, and the Philadelphia County Medical Society; a member of the Rittenhouse Club and of the Zeta Psi fraternity.

He was a stockholder of the Academy of Music and attended the opera regularly. He was much interested in the affairs of the Episcopal church, of which he was a life-long member, was a member of the Vestry of the Church of the Ascension, was Rector's Warden and Delegate to the Diocesan convention for that church for several years.

Doctor Neilson is buried in the churchyard of Old Saint Davids, Radnor, Pa.

# Memoir of David Riesman, M.D.*

*By* Thomas Fitz-Hugh, Jr., M.D.

TO THE Fellows of the College of Physicians of Philadelphia no catalogue of the milestones along the highroad of life trod by David Riesman need be presented. This record of achievement and service is preserved for posterity in various easily accessible sources. No record, however, short of a saga by a master biographer, could portray the human history, professional significance and personal achievement of such a life as that of David Riesman—which began in Saxe-Weimar, Germany, March 25, 1867 and ended here at home in the Hospital of the University of Pennsylvania on June 3, 1940 in its seventy-fourth year.

Tonight let us—his associates, students and colleagues, his friends and co-workers in this College—pause to relate some keepsake memories and impressions.

David Riesman the Teacher is the rôle in which many of us first met him. The qualities which characterized his teaching—both didactic and clinical—were mastery of the subject in hand, simplicity and authoritative forcefulness of presentation, enthusiastic zeal in championing and proving the value of clinical methods, stimulative interest in the historical aspects, erudite skill in etymological instruction (without pedantry), and never-failing intuitive consideration, in the clinic, wards, office, and at the bedside, of the patient first and always.

David Riesman the Physician was Riesman the Teacher in action. He was always both in one—the complete negation of the cynicism that "he who can does and he who cannot teaches." The quality that has impressed me most vividly over the more than twenty years I knew him, was his unfailing interest in the routine of a tremendous clinical practice. I can honestly assert that I never saw him bored or "fed up" with the practice of medicine in any of its details. About twenty years ago a sophisticated senior resident once remarked, in a somewhat superior tone, "Dr. Riesman gets as big a kick out of 'making a diagnosis' as a third-year student." That was true and remained true, praise be, to the end of his life. His concern for the human dignity and personal welfare of each patient was fundamental. This motive led him into implied conflict at times and caused him occasionally to be misunderstood. Some of these silent skirmishes had to do with the relative values to the patient of the exigencies of the busy surgeon's operative schedule on the one hand and the benediction on the other hand of Dr. Riesman's presence at the side of his patient during the surgical ordeal. Some were concerned with the sometimes indifferent attitude, toward patients, of hospital managements. And some (very special and exceptional were these) arose out of the occasionally controversial and ill-defined category of so-called professional ownership-rights of the physician-patient relationship. None of these skirmishes, however, was unseemly or contentious.

* Read at the Business Meeting of the College, January 6, 1941.

Each was handled with the dignity and gentle strength of a man possessed of a mystical quality of faith in the importance of his own rôle as a great physician.

This quality of mystical faith—present despite his thoroughly critical scientific knowledge and mastery of modern methods of precision and practice—was the essential element of his success in the Art of Medicine. This gave to his prescriptions that added power, beyond the pharmacodynamics of their ingredients, which contributed to the comfort, peace and faith-in-recovery of his patients. Recently a doctor said to me, speaking of his father, who was also a doctor, "Dad was dying of coronary thrombosis and he knew it, but when his old friend David Riesman came all the way down here to North Carolina to see him and prescribe for him he improved remarkably." Representative of another type of patient-response is the simple refrain, which I shall not forget, from the lips of an old lady in the semi-private ward whose gangrenous foot had been saved from amputation by Dr. Riesman's judgement, skill and patience: "Next to Gott iss Dr. Riesman." And finally, the more sophisticated appreciation of the Philadelphia Dowager who summed it all up, perhaps bromidically but none-the-less significantly: "He knew my constitution perfectly. He was so wise and understanding. I always felt better when I saw him."

And what of Riesman the man? He was many things to many men and each of us will cherish his own picture. He was kindly and wise, forceful and stimulating, tolerant, versatile, cultivated and amazingly industrious. The depth and scope of his interests were remarkable. He was a self-taught master and lover of the classics. He was an authority on medical and medieval history. He was a profound student of astronomy, archeology and atomic physics. He was active in civic and social service organizations. He was a delightful companion. In past years, he and Mrs. Riesman, the gifted wife from whom he derived much inspiration and help and upon whom he depended for guidance in all important decisions, were hosts to many generations of students and internes. With all of this, his teaching and hospital activities and the largest private and consulting practice in internal medicine in Philadelphia of the past twenty years, he found time to deliver many addresses in all parts of the country, wrote and edited a number of books, and contributed more than 250 articles to the medical literature. Dr. Riesman's own "explanation" of his amazing vigor and productive energy was given at the testimonial dinner on the occasion of his 70th birthday. He said, "I have maintained contact with 'young men' of all ages."

I think that civilized, modern death often comes so professionally camouflaged and obscured that opportunity is lacking for revelation of the true spirit of the man who thus faces this ultimate enigma of his personal existence. To some, however, and especially to doctors, death comes, clearly and unmistakably into view, just a little way down "the narrow road." Under such circumstances the last illness may then become an important occasion in which the courage, dignity, gentleness and unextinguishable kindliness of the really great man may emerge above pain and despair to ease the sorrow of those who stand beside and watch and remember.

Thus David Riesman faced the shadow—at first as a wise physician calmly exploring possible avenues of diagnostic escape and therapeutic relief.

Finally, though no word of it was spoken, I believe he faced the reality—with characteristic patience, courage and whimsical charm. *Memento mori*, the lugubrious injunction of some medieval religionist, takes on real meaning and value in the paraphrase *memento vivere*, which must have been an impelling motto in the busy, useful, distinguished life of David Riesman.

# Memoir of Charles Perry Fisher*

(*Librarian of the College of Physicians of Philadelphia, 1882–1932*)

*By* Burton Chance, M.D.

ON OCTOBER 28th there passed out of this life one who had served the College with outstanding and remarkable efficiency—*Charles Perry Fisher*—for fifty years the active Librarian of the College. From the days when he was only an assistant, his was an unwearied devotion to the interests of the College, which interest increased when, in 1883, he became Librarian, and later when he was appointed Superintendent of the Hall.

It seems fitting that this Section should make some note of Mr. Fisher; because, not only was he custodian of the Library, but he was also the helpful friend of the Section.

When Mr. Fisher entered the Library, the collection comprised but about 25,000 volumes, inadequately classified and miserably shelved. In 1909, under his personal direction the library, then consisting of about 100,000 volumes, was removed from the Old Hall at 13th Street to the new building. Before the moving an account of stock was made and verified, and again, after all were put into their present commodious stacks, another accounting was made. It was a stupendous operation, yet in that transfer only one work was lost, and that only an inconsequential reprint. During his tenure the library's contents were greatly increased and the character of that vast assemblage improved and varied. Much of this was due to Mr. Fisher's knowledge and skill. We need not now go into details except to call attention to certain noteworthy items. The card-index catalogue was begun and carried on by him. He installed the photostating machine, with which precious works have been photographed and made available for handling; and by it are made duplications of materials useful in the preparation of our reports and literary output.

Mr. Fisher wrote several papers on historical subjects. The College is especially interested in the list of the incunabula which he prepared some years ago and later revised. Not only by it were the Fellows made aware of the greatness of the Library's possession of works published before the close of the 15th Century, but Fisher's list is widely quoted in systematic works on medical bibliographies.

This Section may surely speak for all in the College who had ever sought his help in their studies, when we recall his willingness to help us in our researches, and that helpfulness has had its effect in advancing the progress of this Section.

Mr. Fisher did not confine his interests to the College library. He helped to found the Association of Medical Librarians, now known as the Medical Library Association. He served a term as its President and continued to be an active member in that organization. He was known to be one of the foremost medical librarians. He retired from the College on July 1, 1932, leaving for his successor and us the care of one of the most valuable medical libraries in the world.

* Read at a meeting of the College's Section on Medical History, November 11, 1940; printed on the recommendation of the censors.

# Transactions of the Sections

## SECTION ON GENERAL MEDICINE

*Regular Meeting, January 27, 1941*

An Appraisal of the Surgical Treatment of Ulcerative Colitis. Kendall A. Elsom, M.D., and L. Kraeer Ferguson, M.D.

Relationships and Distinctions between Shock and the Effects of Hemorrhages. Virgil H. Moon, M.D., David R. Morgan, M.D., and Marshall M. Lieber*, M.D.

Irradiation of the Pituitary Gland in Posterior Lobe Hyperfunction Controlled by Biologic Tests. Eugene P. Pendergrass, M.D., John Q. Griffith, M.D., and Philip J. Hodes, M.D.

Stilbestrol-Induced Testicular Degeneration in Hypersexual Males. Charles W. Dunn, M.D.

*Regular Meeting, February 24, 1941*

Hemorrhagic Disease Due to a Qualitative Defect in Blood Platelets. L. M. Tocantins, M.D.

Relapsing, Febrile Panniculitis. W. Paul Havens*, M.D.

Pheochromocytoma Associated with Paroxysmal Hypertension. Thomas C. Garrett*, M.D., and Edward L. Bortz, M.D.

Further Studies on the Prothrombin Values of Maternal and Cord Blood at Delivery. Robert F. Norris, M.D., and Matthew C. Bennett*, M.D.

## SECTION ON MEDICAL HISTORY

*Regular Meeting, February 14, 1941*

The Social History of Public Health. Henry E. Sigerist*, M.D.

* *By invitation.*

*Regular Meeting, March 10, 1941*

The Concept of the Specific in Medicine.[1] Iago Galdston*, M.D.

## SECTION ON OPHTHALMOLOGY[2]

*Regular Meeting, January 16, 1941*

Chiasmal Lesion: Presentation of a Case. Walter I. Lillie, M.D.

Emory Hill. William Zentmayer, M.D.

Recent Progress in Central Field Studies. John N. Evans*, M.D.

*Regular Meeting, February 20, 1941*

Removal of Non-magnetic Intraocular Foreign Body: Case Presentation. Edmund B. Spaeth, M.D.

Clinical Observations on the Treatment of Squint. Jacob B. Feldman*, M.D.

Retrobulbar Injection of Alcohol in Cases of Acute Glaucoma: Exhibition of Cases. C. E. G. Shannon, M.D.

Sulfathiazole in the Treatment of Gonorrheal Eye Disease. Carroll R. Mullen, M.D.

## SECTION ON OTOLARYNGOLOGY[3]

*Regular Meeting, January 15, 1941*

Frontal Sinusitis. John Mackenzie Brown*, M.D.

Complications of Frontal Sinusitis. George M. Coates, M.D.

[1] Printed in this issue of the *Transactions & Studies.*

* *By invitation.*

[2] The transactions of this Section are abstracted in the *American Journal of Ophthalmology* and the *Archives of Ophthalmology.*

[3] The transactions of this Section are abstracted in the *Archives of Otolaryngology.*

* *By invitation.*

*Meeting, February 20, 1941*[4]

PRESENTATIONS BY THE CENTRAL INSTITUTE AND THE NATIONAL FORUM FOR DEAFNESS

INFECTIONS OF THE MIDDLE EAR AS RELATED TO OTHER UPPER RESPIRATORY INFECTIONS. George S. Frauenberger*, M.D.

INFECTIONS OF THE MIDDLE EAR IN RELATION TO DEAFNESS. James A. Babbitt, M.D.

[4] Joint meeting with the Philadelphia Pediatric Society.

## SECTION ON PUBLIC HEALTH, PREVENTIVE AND INDUSTRIAL MEDICINE

*Meeting, February 3, 1941*

PRACTICAL ASPECTS OF INDUSTRIAL POISONING. Max Trumper*, PH.D.

INDUSTRIAL MEDICINE. G. H. Gehrmann*, M.D.

# Officers, Committees, and Administrative Staff of the College, 1941

*President*

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*Vice-President*

O. H. Perry Pepper

*Censors*

John H. Gibbon
Francis R. Packard
Albert P. Brubaker
George P. Muller

*Secretary*

J. Harold Austin

*Treasurer*

John B. Flick

*Honorary Librarian*

Charles W. Burr

*Elective Councillors*

To serve until January, 1942
Eugene P. Pendergrass
Truman G. Schnabel

To serve until January, 1943
Robert H. Ivy
T. Grier Miller

To serve until January, 1944
Stanley P. Reimann
William G. Turnbull

## Council

The foregoing officers and the chairmen of the nine standing committees.

### STANDING COMMITTEES

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John H. Gibbon, jr.
John P. Scott

*Library*

W. Egbert Robertson, *Ch'n*
John H. Arnett
Burton Chance
Louis B. Laplace
Jacob H. Vastine
The Honorary Librarian (*ex officio*)

*Hall*

Hubley R. Owen, *Ch'n*
Joseph T. Beardwood, jr.
W. E. Chamberlain
Joseph C. Doane
Robert A. Kimbrough, jr.

*Mütter Museum and College Collections*

J. Parsons Schaeffer, *Ch'n*
R. Philip Custer
Aims C. McGuiness

*Finance*

Henry P. Brown, jr. *Ch'n*
Francis C. Grant
Isaac Starr
The President and the Treasurer (*ex officiis*)

*Scientific Business*

Edward L. Bortz, *Ch'n*
Charles L. Brown
Burgess L. Gordon
The President and the Secretary (*ex officiis*)

*Public Health, Preventive Medicine and Public Relations*

Joseph Stokes, jr., *Ch'n*
Samuel Bradbury
A. Parker Hitchens
Maurice S. Jacobs
Martha Tracy
The President (*ex officio*)

*Entertainments*

I. S. Ravdin, *Ch'n*
Gilson C. Engel
Edward Rose
The President (*ex officio*)

## PRIZE COMMITTEES AND TRUSTEES

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Emily P. Bacon
Francis D. W. Lukens
Edward Weiss
Francis C. Wood

*Nathan Lewis Hatfield Prize and Lectureship*

Ralph Pemberton, *Ch'n*
Charles C. Norris
Ralph M. Tyson

*Mary Scott Newbold Lectures*

Grayson P. McCouch, *Ch'n*
Kendall A. Elsom
Harold W. Jones
The President and the Chairman of the Committee on Scientific Business (*ex officiis*)

*Weir Mitchell Oration*

Francis W. Sinkler, *Ch'n*
Henry P. Brown, jr.
David L. Farley
Francis C. Grant
Edward A. Strecker

*Trustees of Nathan Lewis Hatfield Prize and Lectureship*

William D. Stroud, *Ch'n*
John B. Carson
J. Montgomery Deaver

*Trustee Under the Will of Thomas Skelton Harrison*

Charles J. Hatfield

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## Administrative Staff of the College

*Librarian, Editor, and Superintendent*

W. B. McDaniel, 2d

*Curator of the Mütter Museum and the College Collections*

Joseph McFarland

---

*Clerk*, Olga E. Lang
*Assistant Clerk*, Helen M. Nash

---

*Assistant Superintendent*, Robert G. Muir

# Fellows

## March 31, 1941

ELECTED

1934. Abbott, William Osler, 133 S. 36th St.
1912. Addison, William H. F., Medical Laboratories, Univ. of Pa.
1926. Adler, Francis Heed, 313 S. 17th St.
1914. Aiken, Thomas G., Berwyn, Pa.
1936. Aldridge, Fred Cutler, Wayne, Pa.
1936. Alexander, Fay Knight, 8835 Germantown Ave.
1906. Allen, Francis Olcott, Jr., 2216 Walnut St.
1932. Allen, Frederick H., 1711 Fitzwater St.
1935. Alpers, Bernard J., 111 North 49th St.
1933. Alston, Robert S., 121 Walnut Lane.
1905. Anspach, Brooke M., 1827 Spruce St.
1930. Appel, Kenneth E., 408 Berkley Rd., Haverford, Pa.
1905. Appleman, Leighton Francis, 308 S. 16th St.
1935. Armitage, George L., 400 E. 13th St., Chester, Pa.
1922. Arnett, John H., 2116 Pine St.
1920. Astley, G. Mason, 812 N. 63rd St.
1935. Atlee, John L., 37 E. Orange St., Lancaster, Pa.
1935. Atlee, John L., Jr., 37 E. Orange St., Lancaster, Pa.
1914. Austin, J. Harold, 821 Maloney Clinic, Univ. of Pa.
1906. Babbitt, James A., 1912 Spruce Street.
1935. Bach, Theodore F., 1900 Rittenhouse Sq.
1937. Bacon, Emily P., 2104 Spruce St.
1916. Balentine, Percy L., 407 Weightman Bldg., 1524 Chestnut St.
1898. Balliet, Tilghman M., 3920 Sansom St.
1940. Banes, C. C. A., 2043 N. 12th St.
1934. Bank, Joseph, 737 W. Moreland St., Phoenix, Ariz.
1940. Barba, Philip S., 222 W. Harvey St., Germantown.
1911. Barnard, Everett P., 1820 S. Rittenhouse Sq.
1939. Barnshaw, H. D., 406 Cooper St., Camden, N. J.
1939. Bartle, Harvey, Jr., 133 S. 36th St.
1924. Bartle, Henry J., 1930 Chestnut St.
1931. Bates, William, 2029 Pine St.
1932. Batson, Oscar V., 3502 Hamilton St.
1921. Bauer, Edward L., 345 S. 19th St.
1933. Bauer, John T., Pennsylvania Hospital.
1939. Baumann, Frieda, 1930 Chestnut St., Phila.
1922. Bazett, Henry C., Haverford, Pa.
1938. Beach, Edward Warren, 4400 Walnut St.
1908. Beardsley, E. J. G., 1919 Spruce St.
1930. Beardwood, Joseph T., Jr., 2031 Locust St.
1935. Beerman, Herman, Chatham Court Apts., 49th and Locust Sts.
1932. Behney, Charles A., 3722 Chestnut St.
1934. Behrend, Moses, 1738 Pine St.
1930. Belk, William Parks, Ardmore, Pa.

1936. Bell, Benjamin Tertius, 1930 Chestnut St.
1941. Bernstein, Mitchell, 1321 Spruce St.
1937. Bertolet, J. Allan, 1530 Locust St.
1934. Biddle, Sydney Geoffrey, Medical Towers Bldg., 17th and Latimer Sts.
1918. Billings, Arthur E., 2020 Spruce St.
1917. Birdsall, Joseph C., 139 Booth Lane, Haverford, Pa.
1933. Bishop, Paul A., Pennsylvania Hospital.
1917. Block, Frank B., 1017 Medical Arts Bldg.
1929. Bockus, Harry L., 250 S. 18th St.
1928. Boles, Russell S., Rittenhouse Plaza.
1923. Bond, Earl D., 707 Old Lancaster Road, Bryn Mawr, Pa.
1911. Bonney, Charles W., 1117 Spruce St.
1924. Boon, David J., 1532 N. 15th St.
1931. Bortz, Edward Le Roy, 2021 W. Girard Ave.
1921. Borzell, Francis Frank, 4940 Penn St., Frankford.
1936. Bostwick, Delazon Swift, 106 Linwood Ave., Ardmore, Pa.
1928. Bothe, Albert E., 255 S. 17 St.
1928. Bothe, Frederick A., 255 S. 17 St.
1923. Bower, John O., 2008 Walnut St.
1907. Boyer, Henry P., 4602 Baltimore Ave.
1925. Boykin, Irvine M., 922 Medical Arts Bldg.
1937. Braceland, Francis J., 111 N. 49th St.
1929. Bradbury, Samuel, 151 W. Coulter St.
1907. Bradley, William Nathaniel, 1725 Pine St.
1921. Bransfield, John W., 2101 Spruce St.
1903. Branson, Thomas F., Rosemont, Pa.
1917. Bromer, Ralph S., 629 Pembroke Road, Bryn Mawr, Pa.
1936. Brown, Charles L., 325 N. Bowman Ave., Merion, Pa.
1932. Brown, Claude P., 1930 Chestnut St.
1919. Brown, Henry P., Jr., 1930 Chestnut St.
1887. Brubaker, Albert P., 109 N. 34th St.
1939. Brust, Raymond W., 4710 Chester Ave.
1935. Buchanan, Mary, 1737 Chestnut St.
1930. Bucher, Carl Joseph, 271 S. 15th St.
1928. Burden, Verne G., 255 S. 17th St.
1940. Burnett, W. Emory, 3401 N. Broad St.
1906. Burns, Stillwell C., 1238 Atwood Rd.
1892. Burr, Charles W., 1527 Pine St.
1906. Butler, Ralph, 1930 Chestnut St.
1934. Buzby, B. Franklin, 414 Cooper St., Camden, N. J.
1907. Cadwalader, Williams B., 133 S. 36th St.
1928. Campbell, Edward H., 2036 Delancey St.
1931. Cantarow, Abraham, 2033 Delancey St.
1935. Carey, Lawrence S., 1930 Chestnut St.
1931. Cariss, Walter L., 2043 Walnut St.
1930. Carpenter, Chapin, 1930 Chestnut St.
1905. Carpenter, Herbert B., 1805 Spruce St.
1926. Carpenter, Howard Childs, 1805 Spruce St.
1895. Carpenter, John T., 1930 Chestnut St.
1917. Carson, John B., 1802 Pine St.

1922. Case, Eugene A., 63 W. La Crosse Ave., Lansdowne, Pa.
1937. Castallo, Mario A., 2126 Spruce St.
1933. Chamberlain, W. Edward, Temple University Hospital.
1939. Chamberlin, George W., 3400 Spruce St.
1900. Chance, Burton, 317 S. 15th St.
1939. Charr, Robert Kyun Hyun, 738 Pine St.
1903. Chrystie, Walter, Bryn Mawr, Pa.
1939. Ciccone, Emmet F., 312 N. 33rd St.
1929. Clark, Eliot R., 315 S. 41st St.
1934. Clark, Jefferson Hamer, 3701 N. Broad St.
1926. Clarke, J. Alexander, 334 S. 21st St.
1926. Clerf, Louis H., 1530 Locust St.
1910. Cloud, J. Howard, 11 W. Montgomery Ave., Ardmore, Pa.
1903. Coates, George Morrison, 1721 Pine St.
1908. Codman, Charles A. E., S.E. Corner 42d and Spruce Sts.
1907. Cohen, Myer Solis, 2110 Spruce St.
1888. Cohen, S. Solis-, 1906 Walnut St.
1920. Cole, Charles J., 7926 Park Ave., Elkins Park, Pa.
1934. Colgan, Robert C., 5734 N. 5th St.
1934. Collins, Leon Howard, Jr., 133 S. 36th St.
1939. Comroe, Bernard I., 1726 Pine St.
1930. Cooper, David A., 1520 Spruce St.
1941. Cornelius, Chalmers E., 119 Summit Ave., Jenkintown, Pa.
1911. Cornell, Walter S., Board of Public Education, Parkway and 21st St.
1914. Corson, Edward F., Medical Arts Bldg., 136 S. 16th St.
1930. Cottrell, James E., 2031 Locust St.
1924. Cowan, Alfred, 1930 Chestnut St.
1940. Cowan, Thomas H., 1930 Chestnut St.
1904. Craig, Frank A., The Henry Phipps Institute, 7th and Lombard Sts.
1907. Crampton, George S., 2031 Locust St.
1937. Crane, Martin P., 2433 Germantown Ave.
1920. Creighton, William J., 37 S. 20th St.
1941. Creskoff, Adolph J., 3400 Spruce St.
1920. Cross, George H., Chester, Pa.
1917. Cross, Sumner H., P. O. Box 126, Jenkintown, Pa.
1921. Crossan, Edward T., 5324 Wayne Ave.
1940. Crowe, Aldrich C., 735 Atlantic Ave., Ocean City, N. J.
1904. Cruice, John M., 406 S. 22d St.
1937. Crump, Jean, 1930 Chestnut St.
1937. Curtis, Lawrence, 255 S. 17th St.
1934. Custer, R. Philip, 4400 Spruce St.
1941. Cuttle, Tracy D., 1930 Chestnut St.
1938. Dannenberg, Arthur M., 235 S. 15th St.
1919. Davies, John R., Jr., 2 E. Chestnut Ave., Chestnut Hill.
1936. Davis, David M., 225 S. 17th St.
1937. Davis, Perk Lee, Suite 1305, Medical Towers, 255 S. 17th St.
1916. David, Warren Beagle, 135 S. 18th St.
1900. Davisson, Alexander H., 900 N. Broad St.
1935. Deaver, J. Montgomery, 1830 Delancey Pl.
1902. Dehoney, Howard, 240 S. 13th St.

1935. Deibert, Irvin Elmer, 538 Cooper St., Camden, N. J.
1924. Deichler, L. Waller, 1930 Chestnut St.
1923. De Long, Perce, N.E. Cor. 20th and Chestnut Sts.
1928. Dewees, A. Lovett, Times Medical Bldg., Ardmore, Pa.
1924. Dillon, Edward S., 2016 DeLancey St.
1932. Dintenfass, Henry, 1305 Spruce St.
1920. Diven, John, 326 S. 19th St.
1941. Dixon, Harold M., 4107 Chester Ave.
1920. Doane, Joseph C., 19th and Spruce Sts.
1933. Donnelly, Joseph C., 2008 Walnut St.
1937. Donnelly, Robert T. M., 255 S. 17th St.
1907. Dorrance, George M., 2101 Spruce St.
1933. Downs, T. McKean, Mt. Pleasant Road, Bryn Mawr, Pa.
1910. Drayton, William, Jr., 407 S. 22d St.
1935. Duane, William, Jr., 2100 Walnut St.
1935. Duncan, Garfield G., 1930 Chestnut St.
1937. Dunn, Charles W., 269 S. 19th St.
1935. Eads, John T., 2029 Delancey St.
1911. Earnshaw, Henry C., Bryn Mawr, Pa.
1936. Easby, Mary Hoskins, 1930 Chestnut St.
1937. Edeiken, Joseph, 1832 Spruce St.
1930. Eiman, John, Cynwyd, Pa.
1911. Eliason, Eldridge L., 326 S. 19th St.
1939. Ellis, Van Mashburn, 1530 Locust St.
1928. Ellison, Richard T., 1614 Locust St.
1936. Ellson, J. Vernon, 255 S. 17th St.
1904. Elmer, Walter G., 1801 Pine St.
1937. Elsom, Kendall A., 133 S. 36th St.
1934. Ely, William C., 3912 Chestnut St.
1932. Engel, Gilson G., 1914 Pine St.
1893. Eshner, Augustus A., 1019 Spruce St.
1905. Evans, William, 500 W. Gay St., West Chester, Pa.
1912. Eves, Curtis C., 1910 Spruce St.
1922. Farley, David L., 1725 Pine St.
1903. Farr, Clifford B., Bryn Mawr, Pa.
1930. Farrell, John T., Jr., 255 S. 17th St.
1935. Ferguson, Lewis Kraeer, 133 S. 36th St.
1936. Fetter, Ferdinand, 322 S. 21st St.
1935. Fetter, Theodore R., 255 S. 17th St.
1924. Fewell, Alexander G., 1924 Pine St.
1928. Fitz-Hugh, Thomas, Jr., 2016 Delancey St.
1928. Flick, John B., Mermont Plaza, Bryn Mawr, Pa.
1939. Flippin, Harrison F., 255 S. 17th St.
1940. Forrester, James S., 714 Maloney Clinic, Univ. of Pa.
1941. Fox, C. Calvin, 1806 Spruce St.
1908. Fox, Herbert, Hamilton Court, 39th and Chestnut Sts.
1906. Fraley, Frederick, 71st and City Line, Overbrook, Pa.
1939. Freeman, Norman E., 320 Hathaway Lane, Wynnewood, Pa.
1935. Fridy, Cyrus Ward, 322 Riverview Ave., Drexel Hill, Pa.
1933. Fritch, James Scott, 269 S. 19th St.

1937. Fritz, Herbert H., Pennswood Rd. and Radnor St., Bryn Mawr, Pa.
1940. Fry, Kenneth E., 1611 Spruce St.
1935. Fry, Wilfred Eyles, 1819 Chestnut St.
1937. Furlong, Thomas F., Jr., Times Medical Building, Ardmore, Pa.
1899. Gamble, Robert G., Haverford, Pa.
1935. Gammon, Geo. D., 133 S. 36th St.
1931. Garner, Vaughn C., Germantown Professional Building.
1935. Geist, Donald C., 1930 Chestnut St.
1917. Gerhard, Arthur H., 1615 N. Delaware Ave.
1899. Gibbon, John H., 1608 Spruce St.
1934. Gibbon, John H., Jr., 1608 Spruce St.
1939. Gibson, Glen Gregory, Temple University Medical School.
1933. Gifford, U. Grant, Kennett Square, Pa.
1920. Gill, A. Bruce, 1930 Chestnut St.
1931. Gilman, Robert Louis, 1930 Chestnut St.
1927. Gilmour, William R., 6616 Woodland Ave.
1931. Giordano, Anthony A. S., 1819 S. Broad St.
1920. Githens, Thomas S., The Cambridge, Wissahickon and School Lane.
1906. Gittings, John C., Harwood, Md.
1906. Goepp, R. Max, 1201 Medical Arts Bldg.
1933. Goldburgh, Harold L., 1932 Spruce St.
1935. Goldsmith, Ralph, Medical Arts Bldg.
1905. Gordon, Alfred, 1900 Locust St.
1928. Gordon, Burgess L., 1832 Spruce St.
1937. Gordon, William, 1721 Pine St.
1894. Graham, Edwin E., 1713 Spruce St.
1926. Grant, Francis Clark, 3400 Spruce St., University Hospital.
1933. Greenbaum, Sigmund S., 320 S. 18th St.
1940. Greene, Lloyd B., Medical Arts Bldg.
1932. Griffith, George C., 4028 Walnut St.
1883. Griffith, J. P. Crozer, 1810 Spruce St.
1934. Griffith, John Q., Jr., 214 Glencoe Ave., Upper Darby, Pa.
1912. Griscom, J. Milton, Medical Tower, 255 S. 17th St.
1941. Groff, Robert A., 255 S. 17th St.
1933. Gruber, Charles M., Jefferson Medical College.
1932. Guequierre, Jacques P., 1930 Chestnut St.
1935. Hadden, Samuel B., 37 S. 20th St.
1935. Haines, Harlan F., 134 S. State Rd., Upper Darby, Pa.
1939. Hamblock, Leonard C., 2230 S. Broad St.
1894. Hamill, S. McC., 1822 Spruce St.
1897. Hand, Alfred, Jr., 1724 Pine St.
1938. Hand, John G., 1724 Pine St.
1932. Harris, Stanley E., Lansdowne, Pa.
1929. Harrison, Francis G., 1900 Spruce St.
1933. Harrison, William John, 135 S. 17th St.
1903. Hart, Charles D., 420 W. Mermaid Lane, Chestnut Hill.
1932. Hartman, J. Calvin, 100 W. Walnut Lane.
1926. Hartmann, Fred L., 1914 Pine St.
1935. Haskell, Benjamin F., 1426 Spruce St.
1936. Hatch, Lerleen Clement, Univ. of Pa. Hospital, 36th and Spruce Sts.

1907. Hatfield, Charles James, Henry Phipps Institute, 7th and Lombard Sts.
1911. Heed, Charles R., 1205 Spruce St.
1927. Herman, Leon, 801 Medical Arts Bldg.
1924. Hewson, William, 6013 Greene St.
1924. Hirst, John C., 2d, 500 N. 20th St.
1908. Hitchens, Arthur Parker, Dept. Public Health and Preventive Medicine, Univ. of Pa.
1939. Hodes, Philip J., X-Ray Dept., University Hospital, 3400 Spruce St.
1905. Hodge, Edward B., 2019 Spruce St.
1931. Holland, H. Albert, 8200 Crittenden St., Chestnut Hill.
1933. Hollingshead, Irving W., 123 S. 18th St.
1932. Hollingsworth, I. Pemberton P., 411 N. Walnut St., West Chester, Pa.
1919. Hopkins, Arthur H., 1726 Pine St.
1925. Hopkinson, R. Dale, Jenkintown, Pa.
1928. Houser, Karl Musser, 2010 Spruce St.
1938. Howell, John Carnett, 326 S. 19th St.
1937. Hughes, Joseph, 4401 Market St.
1939. Hughes, P. Boland, Alden Park Manor, Germantown
1892. Hughes, William E., 3945 Chestnut St.
1937. Hughson, Walter, Abington Memorial Hospital, Abington, Pa.
1923. Hume, John E., N.E. Corner 20th and Chestnut Sts.
1921. Hunter, Robert John, 2011 Chestnut St.
1926. Husik, David N., 1820 Spruce St.
1934. Hustead, Frank H., 5112 N. Broad St.
1898. Hutchinson, J. P., Media, Pa.
1937. Ingle, Harry Barr, 1937 Fairmount Ave.
1935. Ingleby, Helen, Woman's Medical College, East Falls.
1921. Ivy, Robert H., 1930 Chestnut St.
1917. Jackson, Chevalier, 255 S. 17th St.
1932. Jackson, Chevalier L., 255 S. 17th St.
1934. Jacobs, Maurice S., 1831 De Lancey Place.
1922. Jameson, Howard Leon, 250 S. 17th St.
1941. Jeffers, William A., 133 S. 36th St.
1913. Jeffreys, William H., 143 Gray's Lane, Haverford, Pa.
1928. John, Rutherford L., 256 S. 21st St.
1926. Johnson, George Ernest, 5341 Chester Ave.
1938. Johnson, Thomas A., 250 S. 18th St.
1918. Jonas, Leon, 255 S. 17th St.
1924. Jones, Harold W., 1930 Chestnut St.
1900. Judson, Charles F., 1005 Spruce St.
1902. Jump, Henry Draper, 2019 Walnut St.
1936. Kain, Thomas M., 403 Cooper St., Camden, N. J.
1938. Kasper, Kelvin A., 135 S. 18th St.
1941. Kauffman, M. Luther, Medical Arts Bldg., Jenkintown, Pa.
1926. Kaufman, Isadore, 2054 Locust St.
1923. Kay, James, 600 W. Olney Ave.
1938. Keeler, Harold R., 1824 Spruce St.
1913. Kelly, Francis J., 2211 Locust St.
1935. Kelly, George F. J., N.E. Cor. 20th and Chestnut Sts.
1932. Kelly, Herbert T., 1900 Spruce St.
1909. Kelly, James A., 1815 Spruce St.

1912. Kelly, Thomas C., 105 School Lane.
1941. Kennedy, Patrick J., 6910 Market St., Upper Darby, Pa.
1921. Kern, Richard A., Univ. of Pa., University Hospital, 36th & Spruce Sts.
1935. Keyes, Baldwin L., 2025 Walnut St.
1930. Kimbrough, Robert A., Jr., 807 Spruce St., Phila.
1936. King, Orville C., Medical Tower Bldg., 255 S. 17th St.
1931. Kinney, Willard H., 315 S. 17th St.
1920. Klauder, Joseph V., 1934 Spruce St.
1920. Klein, Thomas, 250 S. 18th St.
1934. Klemmer, Roland N., 439 North Duke St., Lancaster, Pa.
1934. Kline, Oram R., 414 Cooper St., Camden, N. J.
1932. Klopp, John W., 913 Medical Arts Bldg., 16th and Walnut Sts.
1919. Knipe, Norman L., 1930 Chestnut St.
1908. Knowles, Frank C., 2035 Spruce St.
1938. Knox, Andrew, 1930 Chestnut St.
1925. Knox, Harry E., 719 66th Ave., Oak Lane.
1914. Kolmer, John A., Cynwyd, Pa.
1936. Konzelmann, Frank Williamson, 3638 N. 21st St.
1932. Kornblum, Karl, 1020 Samsom St.
1941. Krall, J. Thomas, 1927 Spruce St.
1904. Krauss, Frederick, 1930 Chestnut St., Phila.
1941. Krewson, William E., 3rd, 1930 Chestnut St.
1914. Krumbhaar, Edward B., School of Medicine, University of Pennsylvania.
1900. Krusen, Wilmer, Phila. College of Pharmacy.
1907. Langdon, H. Maxwell, 1530 Locust St.
1933. Langdon, Roy L., 5917 Greene St., Germantown.
1934. Laplace, Louis B., 1900 Rittenhouse Sq.
1926. Laws, George M., 1907 Spruce St.
1936. Leaman, William G., 3700 Baring St.
1920. Leavitt, Frederic Headley, 1527 Pine St.
1941. Leberman, Paul R., Medical Arts Bldg.
1934. Lee, Thomas B., 622 Cooper St., Camden, N. J.
1908. Lee, Walter Estell, 1833 Pine St.
1936. Lehrfeld, Louis, 1321 Spruce St.
1935. Lemmon, William T., 1930 Chestnut St.
1920. Leopold, Simon S., 2025 Spruce St.
1933. Levering, J. Walter, 1309 Oak Lane.
1915. Lewis, Fielding O., Providence Road, Media, Pa.
1938. Lewis, James P., 3815 Chestnut St.
1936. Lillie, Walter I., 255 S. 17th St.
1940. Limberger, William A., 301 S. Church St., West Chester, Pa.
1938. Lindauer, M. August, 5901 Warrington St.
1927. Linsey, Walter H., 810 W. Dauphin St.
1936. Lintgen, Charles, 1930 Chestnut St.
1936. Llewellyn, Thomas H., 739 N. 40th St.
1907. Lodholz, Edward, Medical Laboratories, Univ. of Pa.
1931. Loewenberg, Samuel A., 1905 Spruce St.
1938. Long, Charles-Francis, 256 S. 21st St.
1933. Long, Esmond R., Henry Phipps Institute, 7th and Lombard Sts.
1935. Long, William L., 2025 Walnut St.

1893. Longaker, Daniel Carrel, 5702 Overbrook Ave.
1931. Longaker, Edwin P., 41 E. Montgomery Ave., Ardmore, Pa.
1936. Lucchesi, Pascal Francis, Philadelphia Hospital for Contagious Diseases.
1921. Lucké, Balduin H. E., Medical School, Univ. of Pa.
1924. Ludy, John B., 1201 Medical Arts Bldg.
1932. Lukens, Francis D. W., Cynwyd, Pa.
1938. Lukens, Philip Jefferson, Jr., 158 E. Butler Ave., Ambler, Pa.
1930. Lukens, Robert M., 1923 Spruce St.
1929. Lull, Clifford B., Women's Bldg., Penna. Hosp., 807 Spruce St.
1939. Luongo, Romeo A., 2054 Locust St.
1919. Lynch, Frank B., Jr., The Germantown Hospital, E. Wister St., Germantown.
1914. Lyon, B. B. Vincent, 2031 Locust St.
1933. McAndrews, Leo F., Times Medical Bldg., Ardmore, Pa.
1932. McCahey, James F., 1534 Pine St.
1900. McCarthy, Daniel J., 2025 Walnut St.
1936. McCarthy, Patrick A., Central Medical Bldg.
1935. McClenahan, William U., 3 Summit Ave., Chestnut Hill.
1931. McCloskey, Edward, 7 E. Chestnut Ave., Chestnut Hill.
1935. McConnell, James W., 20th and Chestnut Sts.
1934. McCouch, Grayson P., Medical School, University of Pa.
1938. McCrea, Lowrain E., 1930 Chestnut St.
1937. McCutcheon, Morton, Alden Park Manor, Germantown.
1895. McFarland, Joseph, 542 W. Hortter St., Germantown.
1937. McGuinness, Aims C., The Children's Hospital, 1740 Bainbridge St.
1940. McLaughlin, Edward F., 6605 Lincoln Drive.
1933. McLaughlin, James S., 334 S. 21st St.
1924. McMillan, Thomas M., 2044 Locust St.
1924. McPhedran, F. Maurice, Germantown Hosp., Penn and Chew Sts.
1932. Macfarlane, Catharine, Medical Arts Bldg.
1910. Mackinney, William H., 1930 Chestnut St.
1936. MacMurtrie, Wm. J., 912 S. 49th St.
1939. Macneill, Norman M., 5116 N. 5th St.
1935. Maeder, LeRoy M. A., 206 S. 13th St.
1935. Maier, Ernest G., 1323 N. 15th St.
1914. Maier, F. Hurst, 2019 Walnut St.
1936. Mann, Bernard, 2019 Pine St.
1937. Margolies, Alexander, 1836 Delancey St.
1941. Martin, James R., Medical Arts Bldg.
1935. Mason, James B., Ridley Manor, Ridley Park, Pa.
1935. Matthews, Robert A., 111 N. 49th St.
1939. May, Hans, 269 S. 19th St.
1932. Meade, Richard H., Jr., 2016 Pine St.
1934. Mecray, Paul M., 405 Cooper St., Camden, N. J.
1914. Mencke, J. Bernhard, 1816 Spruce St.
1941. Mendell, Theodore H., 1820 Spruce St.
1940. Mengel, Willard G., 400 Penn St., Camden, N. J.
1937. Meyer, George Phillip, 410 Haddon Ave., Camden, N. J.
1935. Miller, Ford A., 4016 Chestnut St.
1934. Miller, Hugh McCauley, 1614 Locust St.
1939. Miller, Malcolm W., 2021 W. Girard Ave.

1939. Miller, Merle M., 6013 Greene St.
1932. Miller, M. Valentine, 114 W. Phil-Ellena St.
1921. Miller, T. Grier, University Hospital, 36th and Spruce Sts.
1937. Missett, Joseph Vincent, Jr., 1814 Spruce St.
1904. Mitchell, Charles Franklin, 2003 Pine St.
1921. Mohler, Henry Keller, 319 S. 16th St.
1932. Mohler, Roy W., 1806 Spruce St.
1936. Montgomery Hugh, 216 Kent Rd., Ardmore, Pa.
1936. Montgomery John B., 1930 Chestnut St.
1932. Montgomery, Thaddeus L., 2031 Locust St.
1928. Moon, Virgil H., Jefferson Medical College.
1935. Moore, John Royal, Beury Bldg., Broad St. and Erie Ave.
1924. Moorhead, Stirling W., 1523 Pine St.
1936. Morgan, David R., Jefferson Medical College.
1886. Morris, Caspar, Haverford, Pa.
1893. Morris, Elliston J., 225 Upland Way, Wayne, Pa.
1941. Mucklé, Craig Wright, 3514 Williamsburg Lane, N.W., Washington, D. C.
1929. Mudd, Stuart, Department of Bacteriology, Medical School, Univ. of Pa.
1935. Mullen, Carroll Richard, 255 S. 17th St.
1934. Mullen, Edward A., 2615 W. Somerset St.
1905. Muller, George P., 1930 Spruce St.
1930. Murphy, Douglas P., 3815 Chestnut St.
1934. Murphy, Eugene C., 1841 S. Broad St.
1905. Mutschler, Louis H., 1625 Spruce St.
1936. Nelson, Guy M., 928 Clinton St.
1905. Newcomet, William S., 3501 Baring St.
1905. Newlin, Arthur, 1804 Pine St.
1938. Newton, Zachariah B., 7109 McCallum St., Mt. Airy.
1935. Nicholson, Jesse Thompson, 1614 Locust St.
1899. Nicholson, William Rufus, 2023 Spruce St.
1941. Nisbet, Verner, 254 S. 45th St.
1905. Norris, Charles C., 133 S. 36th St.
1938. Norris, Robert F., Pennsylvania Hospital, 8th and Spruce Sts.
1933. Nylin, Josef B., University Hospital.
1941. Odenatt, Wm. Burrill, 1213 W. Lehigh Ave.
1913. O'Neal, Alexander Hay, St. Davids, Pa.
1936. Orr, Theodore E., 1930 Chestnut St.
1913. Outerbridge, George W., 1927 Spruce St.
1915. Owen, Hubley R., 319 S. 16th St.
1897. Packard, Francis R., 304 S. 19th St.
1933. Palmer, Harold Dean, 111 N. 49th St.
1909. Parish, Benjamin Dores, 1927 Spruce St.
1940. Parker, Alan P., 255 S. 17th St.
1931. Paul, John Davis, 3112 N. Broad St.
1932. Payne, Franklin L., 133 S. 36th St.
1922. Pelouze, P. S., 1737 Chestnut St.
1909. Pemberton, Ralph, Paoli, Pa.
1930. Pendergrass, Eugene P., 3400 Spruce St.
1932. Pennell, Howard Y., West Chester, Pa.
1939. Pepper, D. Sergeant, 133 S. 36th St.

1914. Pepper, O. H. Perry, University Hospital, 36th and Spruce Sts.
1902. Pepper, William, School of Medicine, Univ. of Pa.
1916. Percival, Milton Fraser, 2332 S. Broad St.
1940. Pessel, Johannes F., Mahlon Drive, Yardley, Pa.
1917. Peter, Luther Crouse, 1930 Chestnut St.
1937. Pettit, Horace, 255 S. 17th St.
1905. Pfahler, George E., 1930 Chestnut St.
1915. Pfeiffer, Damon B., 1822 Pine St.
1935. Phillips, Arthur W., 3904 Walnut St.
1911. Piersol, George Morris, 2031 Locust St.
1933. Pillsbury, Donald M., 133 S. 36th St.
1905. Pitfield, Robert L., 5211 Wayne Ave.
1922. Pleasants, Henry, Jr., West Chester, Pa.
1937. Polk, David Stewart, Rosemont, Pa.
1932. Porter, Roland De Lance, Jenkintown, Pa.
1931. Pryor, Charles Allen, 1910 Spruce St.
1931. Ramsey, Frank M., Chestnut Hill.
1913. Randall, Alexander, 1323 Medical Arts Bldg.
1941. Rankin, Charles A., 1930 Chestnut St.
1926. Ravdin, I. S., 3400 Spruce St.
1941. Rea, Marion Hague, 141 Montgomery Ave., Bala-Cynwyd, Pa.
1938. Read, Hilton Shreve, 5407 Atlantic Ave., Atlantic City, N. J.
1928. Reese, Warren S., 1901 Walnut St.
1925. Reeves, Rufus S., 2227 Spruce St.
1931. Regester, Robert P., 255 S. 17th St.
1920. Rehfuss, Martin E., N.E. Corner 16th and Spruce Sts.
1921. Reiff, E. Paul, 1927 Spruce St.
1937. Reimann, Hobert A., Jefferson Hospital.
1919. Reimann, Stanley P., The Lankenau Hospital Research Institute, Girard and Corinthian Aves.
1929. de Rényi, George S., 212 S. 39th St.
1923. Repplier, Sidney J., 373 Roumfort Rd., Mt. Airy.
1936. Richards, James L., 1930 Chestnut St.
1919. Richardson, Russell, 320 S. 16th St.
1919. Ridpath, Robert F., 1737 Chestnut St.
1936. Ritter, Joseph A., 1900 Rittenhouse Sq.
1933. de Rivas, Damaso, 1831 Chestnut St.
1932. Robbins, Frederick R., 255 S. 17th St.
1939. Roberts, Ella, 133 S. 36th St.
1899. Roberts, Walter, 1921 Spruce St.
1932. Robertson, Harold F., 327 S. 17th St.
1903. Robertson, William Egbert, 327 S. 17th St.
1938. Roche, Philip Q., 255 S. 17th St.
1912. Rodman, John Stewart, 1726 Spruce St.
1934. Rogers, Harry L., Riverton, N. J.
1928. Rose, Edward, University Hospital, 36th and Spruce Sts.
1936. Rose, Elizabeth Kirk, 426 Owen Rd., Wynnewood, Pa.
1909. Rosenberger, Randle C., Rahns, Pa.
1932. Rothrock, Harry A., West Chester, Pa.
1936. Rothschild, Norman, 235 S. 15th St.

1933. Rowntree, Leonard George, 1520 Spruce St.
1937. Roxby, John B., Dept. of Anatomy, Temple University, Broad and Ontario Sts.
1941. Royster, Hubert A., Jr., Mermont Apts., Bryn Mawr, Pa.
1933. Rudolphy, Jay Besson, 230 S. 21st St.
1905. Rugh, J. Torrance, 911 Medical Arts Bldg.
1929. Ryan, William J., Medical Arts Bldg.
1936. Sands, Joseph Evans, Rosemont, Pa.
1905. Sartain, Paul J., 2006 Walnut St.
1908. Sautter, Albert C., Germantown Professional Bldg.
1927. Saxon, Gordon J., 5314 Spruce St.
1920. Scarlett, Hunter W., 230 S. 21st St.
1939. Scattergood, Joseph, Jr., 115 S. High St., West Chester, Pa.
1917. Schaeffer, J. Parsons, 4634 Spruce St.
1932. Schaffer, Howard W., 269 S. 21st St.
1929. Scheffey, Lewis C., 255 S. 17th St.
1929. Schenck, Harry P., 1912 Spruce St.
1917. Schnabel, Truman G., 1704 Pine St.
1917. Schoff, Charles H., Media, Pa.
1928. Schofield, Frederick S., 822 Medical Arts Bldg.
1921. Schumann, Edward A., 1814 Spruce St.
1930. Scott, John Porter, 1740 Bainbridge St., The Children's Hospital.
1940. Scott, T. F. McNair, 315 Pelham Road, Germantown.
1917. Service, Charles A., Bala, Pa.
1924. Shallow, Thomas A., 1611 Spruce St.
1908. Shannon, Charles E. G., 1930 Chestnut St.
1928. Sharpe, John S., Haverford, Pa.
1928. Sharpless, Frederick C., Rosemont, Pa.
1897. Sharpless, William T., West Chester, Pa.
1941. Shaw, John J., The Warwick, 1701 Locust St.
1931. Sheehan, William C., 8314 Germantown Ave.
1932. Sheridan, Joyce T., 412 W. Durham St.
1906. Shields, William G., 414 School Lane, Germantown.
1936. Shipman, James Shelby, 255 S. 17th St.
1935. Shoemaker, Robert, 3rd, 68 Byberry Rd., Hatboro, Pa.
1896. Shoemaker, William T., 2017 Locust St.
1900. Shumway, Edward Adams, 1737 Chestnut St.
1939. Shumway, Norman P., Rittenhouse Plaza
1936. Shuster, Benjamin H., 1824 Pine St.
1941. Silcox, Louis E., 1520 Spruce St.
1903. Sinclair, John F., 4103 Walnut St.
1907. Sinkler, Francis W., 1226 Medical Arts Bldg.
1902. Siter, E. Hollingsworth, 2213 Delancey Place.
1928. Skillern, Samuel R., 1734 Pine St.
1933. Smelzer, Donald Campbell, Graduate Hospital.
1929. Smith, Austin T., 259 S. 17th St.
1933. Smith, Lauren Howe, 111 N. 49th St.
1937. Smith, Lawrence Weld, Temple School of Medicine, North Broad and Ontario Sts.
1936. Smith, Richard Manges, 329 S. 12th St.
1927. Smyth, Calvin Mason, Medical Arts Bldg.
1919. Smyth, Henry Field, 140 W. Baltimore Ave., Lansdowne, Pa.

1938. Snodgrass, L. E., 7903 Oxford Ave., Fox Chase, Pa.
1941. Snyder, G. Gordon, Mermont Apts., Bryn Mawr, Pa.
1935. Sokoloff, Martin J., 255 S. 17th St., Phila.
1922. Solis-Cohen, Leon, 1923 Spruce St., Phila.
1940. Soloff, Louis A., 2032 Pine St.
1935. Sommer, George N. J., 120 W. State St., Trenton, N. J.
1933. Spackman, Edgar W., Hamilton Court, 39th and Chestnut Sts.
1928. Spaeth, Edmund B., 1930 Chestnut St.
1937. Spangler, John Luther, Devon, Pa.
1935. Spiegel, Ernest, 6807 Lawnton Ave., Oak Lane.
1929. Sponsler, Marshall B., 1934 Spruce St.
1894. Stahl, B. Franklin, Haverford, Pa.
1909. Starbuck, J. Clinton, 42 East Washington St., Media, Pa.
1927. Starr, Isaac, 505 Cresheim Valley Rd.
1936. Steinfield, Edward, N.E. Cor. 18th and Chestnut Sts.
1901. Stevens, Arthur A., 314 S. 16th St.
1914. Stewart, Thomas S., Bellevue Stratford Hotel.
1941. Stewart, Winifred B., 2028 Delancey St.
1931. Stiles, Merritt H., 113 W. Chestnut Ave., Chestnut Hill.
1934. Stimson, Cheney M., 167 Harvey St., Germantown.
1925. Stokes, John H., 4228 Spruce St.
1928. Stokes, Joseph, Jr., 1740 Bainbridge St.
1923. Strecker, Edward A., 111 N. 49th St.
1923. Stroud, William Daniel, 1011 Clinton St.
1937. Strumia, Max M., Bryn Mawr Hospital, Bryn Mawr, Pa.
1933. Stuckert, Harry, 248 S. 21st St.
1937. Sturgis, Margaret C., 1930 Chestnut St.
1927. Sturgis, Samuel Booth, 34 W. Montgomery Ave., Ardmore, Pa.
1934. Summey, Thomas J., 1930 Chestnut St.
1930. Sunderman, F. William, 2210 Delancey St.
1936. Surver, James Miller, 1832 Spruce St.
1928. Swartley, William B., 6002 Greene St.
1934. Sweeney, John A., 1900 Rittenhouse Sq.
1900. Talley, James Ely, Lima, Del. Co., Pa.
1933. Taylor, Herbert W., Haverford, Pa.
1931. Taylor, Norman H., 100 W. Evergreen Ave.
1928. Thomas, J. Earl, Drexel Hill, Pa.
1907. Thomas, T. Turner, 1737 Chestnut St.
1927. Thorington, J. Monroe, 2031 Chestnut St.
1898. Thornton, Edward Q., 1331 Pine St.
1936. Thornton, Mary Bickings-, 2703 West Somerset St.
1936. Thorp, Francis Quicksall, 1367 Oxford St.
1930. Thorpe, Edward S., Jr., School of Medicine, Univ. of Pa.
1936. Thudium, William J., Medical Arts Bldg.
1935. Tocantins, Leandro Maués, 45 Woodale Rd.
1935. Toland, Owen J., Episcopal Hospital, Front and Lehigh Ave.
1941. Tompkins, Pendleton, 255 S. 17th St.
1936. Towson, Charles Emory, Germantown Professional Bldg., Phila.
1934. Tracy, Martha, Woman's Medical College of Pa.
1908. Tracy, Stephen E., 1930 Chestnut St.

1926. Tucker, Gabriel, 326 S. 19th St.
1938. Tuft, Louis, 1530 Locust St.
1933. Tumen, Henry J., 2022 Spruce St.
1938. Turman, Christopher M., Wyncote, Pa.
1935. Turnbull, William G., Phila. General Hospital.
1923. Turner, Creighton H., 1731 Pine St.
1929. Tyson, Ralph M., 255 S. 17th St.
1937. Uhle, Charles A. W., 255 S. 17th St.
1907. Ullom, Josephus T., Carpenter and Quincy Sts.
1934. Ulrich, George A., 309 S. 12th St.
1937. Vander Veer, Joseph B., 302 S. 19th St.
1937. Van Loon, Emily Lois, 1930 Chestnut St.
1933. Vastine, Jacob H. 2nd, Medical Arts Bldg.
1912. Vaux, Norris Wistar, 807 Spruce St.
1940. Voegelin, Adrian W., 1521 Lindley Ave.
1903. Wadsworth, William S., 3914 Baltimore Ave.
1927. Wagers, Arthur J., 1429 Spruce St.
1928. Wagoner, George W., Haverford Gables, Haverford, Pa.
1938. Waldman, Joseph, 1930 Chestnut St.
1931. Walker, Herschel C., Wynnewood, Pa.
1906. Walker, John K., Media, Pa.
1907. Walker, Warren, 1819 Chestnut St.
1932. Walkling, Adolph A., Medical Arts Bldg.
1904. Walsh, Joseph, 521 Medical Arts Bldg.
1895. Wagson, Arthur W., 2013 Locust St.
1932. Watt, Charles C., Jr., 6605 Wayne Ave.
1933. Waygood, James Jamison, 3464 W. School Lane.
1903. Weber, Charles H., 3 Arch Bay, Laguna Beach, Cal.
1930. Weeder, S. Dana., 6110 Greene St.
1920. Weidman, Fred D., 20 Tenby Rd., Llanerch, Pa.
1933. Weiss, Benjamin P., The Lenox, 13th and Spruce Sts.
1923. Weiss, Edward, 1923 Spruce St.
1935. Whelan, G. L., 2100 Walnut St.
1921. Whitaker, William, 5448 Germantown Ave.
1936. White, Ellen Pawling Corson-, 1820 Pine St.
1925. Widmann, Bernard P., 250 S. 18th St.
1936. Wilder, Theodore S., Germantown Professional Bldg., Greene and Coulter Sts.
1936. Wilkinson, Richard Powers, 1613 S. Broad St.
1914. Willard, De Forest P., 1726 Spruce St.
1935. Willard, John Harrington, 2022 Locust St.
1939. Willauer, George, 1930 Chestnut St.
1907. Williams, Carl, School Lane and Greene St.
1924. Williams, Horace James, 5908 Greene St., Germantown.
1937. Williams, John C., 6370 Germantown Ave.
1920. Williams, Philip F., 2206 Locust St.
1927. Williamson, Ernest G., 6353 Woodbine Ave.
1916. Wilmer, Harry Bond, 138 W. Walnut Lane, Germantown.
1921. Wilson, George, 133 S. 36th St.
1937. Wilson, Ross B., 1820 S. Rittenhouse Sq.
1902. Wilson, Samuel M., 1930 Chestnut St.

1897. Wilson, W. Reynolds, Villa Nova, Pa.
1940. Winchell, A. Vaughn, 1411 Orchard Way, Rosemont, Pa.
1904. Wister, James W., 5430 Germantown Ave.
1933. Wohl, Michael G., 1727 Pine St.
1918. Wolferth, Charles C., 26 Raynham Rd., Merion, Pa.
1893. Wood, Alfred C., 2035 Walnut St.
1932. Wood, Francis C., Wynnewood, Pa.
1900. Wood, George B., N.E. Corner 20th and Chestnut Sts.
1903. Wood, Horatio C., 319 S. 41st St.
1897. Woodward, George, W. Willow Grove Ave., Chestnut Hill.
1928. Wright, Carroll S., 1402 Spruce St.
1937. Yaskin, Joseph C., 1832 Spruce St.
1941. Young, Barton R., 8327 Roberts Road, Elkins Park, Pa.
1894. Zentmayer, William, 1930 Chestnut St.
1895. Zimmerman, Mason W., 1518 Waverly St.
1933. Zulick, J. Donald, 2008 Walnut St.

# Non-Resident Fellows

ELECTED

1916. Bell, Rear Admiral William H., M.C., U.S.N., 5 W. Blackthorn St., Chevy Chase, Md.
1903. Biggs, M. H., Rutherfordton, N. C.
1936. Brown, Clark E., Dept. Pathology, University of N. Carolina, Chapel Hill, N. C.
1908. Cadbury, William W., Dr. Sun Yat Sen Medical College, Lingnan University, Canton, China.
1936. Camero, Anthony R., 657 S. Westlake Ave., Los Angeles, Cal.
1936. Clarke, Francis Mann, 116 New St., New Brunswick, N. J.
1937. Conaway, W. P., 1723 Pacific Ave., Atlantic City, N. J.
1936. Cooper, Melbourne J., Nix Professional Building, 414 Navarro St., San Antonio, Texas.
1897. Dorland, W. A. Newman, 4512 Sheridan Road, Chicago, Ill.
1905. Evans, Joseph S., Jr., 1300 University Ave., Madison, Wis.
1933. Fowler, Kenneth, 880 Fidelity Medical Bldg., Dayton, Ohio.
1935. Fretz, John Edgar, 114 N. 3rd St., Easton, Pa.
1913. Gates, Nathaniel, 10 Peterboro, Detroit, Mich.
1936. Guthrie, Donald, 118 S. Wilbur Ave., Sayre, Pa.
1902. Gwyn, Norman B., 109 Madison Ave., Toronto, Canada.
1928. Hayman, Joseph Marchant, Jr., Lakeside Hospital, 2065 Adelbert Road, Cleveland, Ohio.
1892. Hinsdale, Guy, White Sulphur Springs, W. Va.
1933. Hitzrot, Lewis H., Medical Director, Mercersburg Academy, Mercersburg, Pa.
1936. Hughes, Brady A., 5005 42d Place, North, Birmingham, Ala.
1912. Hunter, John W., McDaniel, Md.
1885. Jackson, Edward, Republic Building, Denver, Colorado.
1900. Jopson, John H., Waverly Mills, S. C.
1887. Kelly, Howard A., 1418 Eutaw Place, Baltimore, Md.
1932. Landis, Eugene M., 34 University Circle, Charlottesville, Va.
1935. McGuire, Hunter H., 105 N. Braddock St., Winchester, Va.
1900. McReynolds, Robert Phillips, 213 S. Broadway, Los Angeles, Cal.

1936. Middleton, William Shainline, State of Wisconsin General Hospital, Madison, Wis
1917. Mitchell, A. Graeme, Childrens' Hospital Research Foundation, Cincinnati, Ohio
1915. Musser, John H., 1430 Tulane Ave., New Orleans, La.
1937. Nicholson, Samuel T., 2d, The Hill School, Pottstown, Pa.
1905. Norris, George W., Dimock, Pa.
1901. Norris, Henry, Waverly Mills, S. C.
1899. Parke, Wm. E., 5637 LaGorce Drive, Miami Beach, Florida.
1926. Paul, John Rodman, Dept. Internal Medicine, Yale University, New Haven, Conn.
1907. Price, George E., Stimson Bldg., Seattle, Wash.
1904. Ravenel, M. P., 203 Westmont Ave., Columbia, Mo.
1936. Reisinger, John A., 6355 31st St. N.W., Washington, D. C.
1907. Royer, B. Franklin, The Hall, R. D. 7, Chambersburg, Pa.
1913. de Schweinitz, George L., 85 E. Broad St., Bethlehem, Pa.
1941. Shands, Alfred R., Jr., 603 Delaware Trust Bldg., Wilmington, Del.
1908. Shoemaker, Harlan, 1930 Wilshire Blvd., Los Angeles, California.
1932. Siegel, Alvin Erdreich, Medical Arts Building, Macon, Ga.
1933. Southworth, Varnum C., 138 Race St., Cambridge, Md.
1934. Stewart, Sloan G., Pacific and N. Carolina Aves., Atlantic City, N. J.
1900. Swan, John M., 457 Park Ave., Rochester, N. Y.
1913. Vail, William Penn, Blairstown, N. J.
1897. Veasey, Clarence Archibald, 1569 Paulsen Medical and Dental Bldg., Spokane, Washington.

# Honorary Fellows

Limited to Fifty, of Whom Twenty May be Foreigners

### American

ELECTED

1909. Crile, George W., m.d., Cleveland Clinic, Euclid Ave. at E. Ninety-third St., Cleland, O.
1917. Miner, Charles Howard, b.s., m.d., Member of Board of Directors, Wilkes-Barre General Hospital; Board of Health, Wilkes-Barre; Board of Directors, White Haven Sanitarium Association and Penna. Tuberculosis Society. 264 S. Franklin St., Wilkes-Barre, Pa.
1936. Richards, Alfred Newton, ph.d., sc.d., m.d. (hon.), l.l.d., Professor of Pharmacology, School of Medicine, Vice-president in charge of Medical Affairs, Univ. of Pa. School of Medicine, Univ. of Pa., Phila.

### Foreign

1928. Archibald, Edward, m.d., McGill University, Montreal, Canada.
1937. Dale, sir Henry Hallett, c.b.e., f.r.s., m.a., m.d., f.r.c.p., Director, National Institute for Medical Research, Hamstead, Eng. Mt. Vernon House, N.W. 3, Hamstead, London.
1924. Hopkins, Sir F. Gowland, m.d., Biochemical Department, University of Cambridge, Cambridge, England.
1922. McCarrison, Sir Robert, kt., c.i.e., m.d., d.sc., ll.d., f.r.c.p., Major-General, Indian Medical Service (retired). 18 Linton Rd., Oxford, England.
1928. Rolleston, Sir Humphrey, bart., g.c.v.o., k.c.b., m.d., d.c.l. (*Durh.*), ll.d., d.sc., Martins, Haslemere, Surrey, England.

# Necrological List

| *Resident Fellows* | *Date of Election* | *Date of Death* |
|---|---|---|
| Dr. Baxter L. Crawford | November, 1924 | January 3, 1940 |
| Dr. Walter Mendelsohn | January, 1923 | January 19, 1940 |
| Dr. Daniel M. Hoyt | March, 1908 | January 27, 1940 |
| Dr. William G. Spiller | October, 1897 | March 18, 1940 |
| Dr. David Riesman | May, 1898 | June 3, 1940 |
| Dr. Samuel Horton Brown | November, 1916 | June 12, 1940 |
| Dr. Charles F. Nassau | December, 1902 | August 11, 1940 |
| Dr. William W. Farr | October, 1893 | August 19, 1940 |
| Dr. Joseph McIver | January, 1931 | September 7, 1940 |
| Dr. Arthur C. Morgan | June, 1918 | October 21, 1940 |
| Dr. P. Brooke Bland | March, 1908 | October 31, 1940 |
| Dr. Robert G. Torrey | November, 1912 | January 11, 1941 |
| Dr. Nelson J. Burden | October, 1935 | January 31, 1941 |
| *Non-Resident Fellows* | | |
| Dr. Edward Browning Meigs | November, 1911 | November 5, 1940 |
| Dr. Emory Hill | October, 1935 | December 4, 1940 |
| *Honorary Fellows* | | |
| Dr. Hans Zinsser | May, 1937 | September 4, 1940 |
| Dr. William L. Estes | June, 1916 | October 20, 1940 |

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# New Data on Embryogenesis in Monkey and Man*

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## REVIEW OF THE THREE-GERM-LAYER DOCTRINE

FROM the beginning of civilization, those men who happened to be interested in natural history, and who left written records of their observations, have studied the origin of animals from eggs. Almost without exception, they tell how they opened hens' eggs and noted the changes occurring from day to day in the embryo chick. We read of the extensive observations of the great Aristotle[1] in which he sought to clarify the nature of the initiation of life. It is probable that he recorded some of the things he saw with sketches, but, if so, there was no means of duplicating them in sufficient number to insure their preservation, and none seem to have survived.

Furthermore, it is to be remembered that Aristotle had no optical equipment for discerning finer structures. He had no reason to suspect that there were any finer structures, and so for him there was no purpose in attempting magnification of his objects. He supposed that what he saw with unaided vision was all there was, and in his writings there is nothing to suggest the possibility that anything further would ever be found. He was therefore justified in accepting, as the starting point for all his embryological deductions, the tiny germinal clot which he could demonstrate in his youngest eggs.

What was good enough for Aristotle was good enough for his large following in the Greek and Roman periods. It was also good enough throughout the Middle Ages and, along with his other writings, was part of the accepted body of learning which, with painstaking care, was copied line by line in the *Scriptoria* of the monasteries and abbeys scattered over Europe.

Not until the making of printed books and about 2000 years after Aristotle is there any real advance in embryological

*Nathan Lewis Hatfield Lecture XXV, The College of Physicians of Philadelphia, April 2, 1941.

[1] "The Works of Aristotle." Volume 4. *Historia animalium.* Translated by D'A. W. Thompson. Oxford University press, 1910.

teaching. Then, for the first time, we have sketches at our disposal, revealing what was seen by these industrious explorers of the unknown, and how they interpreted their specimens. By that time a degree of affluence had made its appearance in the great trading centers of Europe and Princes of Privilege were taking charge of things. Along with them came universities, with students and professors. There were two professors of that period, Fabricius and Malpighi, who are regarded as responsible for the dawn of modern embryology and who should be especially mentioned.

Though Fabricius[2] and Malpighi[3] are acclaimed as the forefathers of embryology, it is to be remembered that they were still working with primitive methods and could not observe what happened in the early stages. It is therefore easily understood that Malpighi in 1672 should be a preformationist. He was followed by many others in the same belief. Buffon,[4] the celebrated French naturalist, writes as late as 1750: "I have opened a great number of eggs both before and during incubation and I am convinced from the evidence of my own eyes that, already at the time the egg issues from the body of the hen, the whole chicken exists in the middle of the Cicatrix (that is, in the little clot that Aristotle had seen). The heat communicated to the egg during incubation serves only to expand the parts."

This, you are to note, was preformation as it was then generally taught. Probably it was so taught in the three colleges which, by that time, had sprung up in the American colonies, providing their stern masters digressed that far from the more important matter of theology.

At about the time of appearance of the third edition of Buffon's great work, Caspar Friedrich Wolff,[5] then in the Academy of Queen Catherine in St. Petersburg, dropped a destructive bomb on preformation. He argued that if the embryo pre-exists, and at first is only smaller, then we ought to see the various organs fully formed, as soon as we see them at all. This he proceeded to show was not true for blood-vessels, which, instead, are built of new materials and in a pattern not present before.

This gave rise to many divergent views and brings us to the period of Pander and von Baer. These two compatriots from Russia arrived at Döllinger's laboratory in Würzburg in the early eighteen hundreds, just as the golden age of anatomical science was coming into bloom in Germany. Dr. Baer, a few years later, was to immortalize himself by the discovery of the mammalian ovum, whereas Pander[6] preceded that accomplishment by the publication of a beautiful atlas on the development of the chick, setting a new standard in embryological description. The reason that this atlas is of special interest to us is that in it the three-germ-layer idea first found expression.

Pander discovered that with appropriate maceration he could separate the early germinal membranes into two layers, which he named the serous and mucous layers, and that between them he could recognize a third, or vascular, layer. From these separate layers, after the

[2] Fabricius ab Aquapendente, H. Opera omnia anatomica et physiologica. Leipzig, 1687.

[3] Malpighi, M. Dissertatio epistolica de formatione pulli in ovo. *In his* Opera omnia, tom. sec., London, 1686.

[4] Buffon, G. L. L., *Comte de.* Histoire naturelle, générale et particulière. 2. ed. Vol. 2, p. 351. Paris, 1750.

[5] Wolff, C. F. Theoria generationis. (*Diss.*) Halle, 1759.

[6] Pander, [H.] C. Beyträge zur Entwickelungsgeschichte des Hühnchens im Eye. Würzburg, 1817.

manner of Wolff's reasoning, he believed that he could trace the origin of the various organs, which appeared to result from the formation of folds, outpouchings and pinchings-off, with subsequent elaboration into definitive forms. Certainly this was a great advance over preformation and homunculism!

It was probably von Baer's drawings[7] and von Baer's prestige that swept away all opposition, and he is generally regarded as the sponsor of the doctrine. It was certainly a remarkable imagination that enabled him to conceive of the cross sections shown in his diagrams in the absence of actual sections—for the microtome was not to come until a generation later. When the microtome did come, his successors were able to perfect the application of the doctrine. With much industry they have been doing this ever since. They have studied embryos of a great variety of animals with the end in view of harmonizing under the three-germ-layer theory all embryonic structures and thereby unifying them under a common ground plan. And so the doctrine has tended to become more rigid and authoritative and the terms *ectoderm*, *mesoderm*, and *endoderm* have acquired a far-reaching significance.

This review of the origin of the three-germ-layer theory has been given because it is now being recognized that the obituary for that kind of a ground plan is about due. In their further studies, embryologists have had trouble in fitting their material to the plan. With increasing frequency they have been forced to decide whether some given specimen or the theory was more trustworthy. Also, from experiments on lower forms new factors in development have been discovered and we find that certain cells and tissues have special determining and organizing powers, quite regardless of the three-germ-layer theory.[8] In this present paper it is my purpose to show that if we have sufficiently well preserved material and a sufficiently complete series of embryos we can trace the functional steps in development in surprising continuity.[9] And I think the reader will agree that the actual evidence of this material is fundamentally at variance with the three-germ-layer concept.

### SEGREGATION OF AUXILIARY FROM FORMATIVE ELEMENTS OF OVUM

On the three plates at the end of this paper is presented a series of stages illustrating certain important features that characterize the macaque embryo during the second and third weeks of its development. Prior to that, during the first week, the fertilized ovum is transported through the oviduct and on the third or fourth day passes into the lumen of the uterus. During this period it undergoes cleavage, in consequence of which the initial step in embryogenesis takes place; namely, the auxiliary elements or substances that are to form the envelopes and structures for the attachment and nourishment of the embryo are segregated from the elements that are to form the embryo itself. In other words, the precocious trophoblast cells become specialized and distinct from the more primitive and less specialized and still dormant embryo-forming cells. Specialization and segregation of material of the egg

[7] v. Baer, K. E. (*a*) De ovi mammalium et hominis genesi. Leipzig, 1827; (*b*) Über Entwickelungsgeschichte der Thiere. Königsberg. Part 1, 1828; Part 2, 1837.

[8] Oppenheimer, J. M. "The non-specificity of the germ-layers." *Quart. Rev. Biol.*, 1940, **15**, 1–27.

[9] Heuser, C. H., and G. L. Streeter. "Development of the macaque embryo." *Contrib. to Embryology*, vol. 29, Carnegie Institution of Washington, Pub. No. 525, 1941.

proceeds with such rapidity in the pig that already at the 16-cell stage the trophoblastic material is almost completely separated from the embryo material. The latter is represented by a few large, primitive cells which are dividing very slowly, and the former consists of small, rapidly dividing cells that are already taking on special form and have begun to function in the creation of an intercellular lakelet of fluid, the beginning segmentation cavity. Thus we soon have a blastocyst and the time has come for implantation.

It is to be noted that development thus starts off as a mechanism of cell division in which daughter cells successively exhibit an unequal subdivision of the parent cell material. This results in a segregation of cell-kinds which is intrinsic and genetic and is not to be attributed to environment. Later, a different type of developmental force is added when these primary cell groups begin to influence each other. Other types of cell groups are thereby created which again in turn exert a directive influence upon each other, enormously increasing the possibilities of tissue specialization. These two forces, the segregation inherent in cell division and the inductive or environmental influence of one cell group on another, overlap in varying proportions and they seem to constitute the basic influences underlying the organization of the embryo. Certainly there is no such thing as germ layers to annoy us during this fundamental period while the ovum is being organized into a blastocyst.

### BLASTOCYST AND ITS IMPLANTATION

Having in mind the factors outlined in the preceding paragraph, we are prepared to start on plate 1. The 8-day monkey blastocyst, in *figures 2 and 3*, shows the ovum at the time the auxiliary structures are for the most part distinctly segregated from the cells that are to form the embryo itself. The embryo makers, as can be seen in *fig. 3*, are large, primitive, blastomere-like cells surrounded by the more precocious and smaller auxiliary cells at the embryonic pole of the ovum. These auxiliary or trophoblast cells are to undergo further proliferation to provide the attaching mechanism of the ovum. From around the margins of the embryonic pole the most advanced of the auxiliary cells extend as a thin membrane to constitute the wall of the blastocyst. It is through the function of this membrane that fluid is passed into the cavity, with the resultant expansion of the blastocyst. A residual coating of the zona pellucida still surrounds the blastocyst but it is about to disappear and will then permit contact of the trophoblast with the uterine epithelium, a requisite for implantation.

By the 9th day (*fig. 4*), the blastocyst has reached its maximum size and its implantation is imminent. The cells that are going to do the attaching lie at the surface of the embryonic pole. Beneath them lie the embryo-forming cells. The large, primitive cells that were seen in *fig. 3* have undergone division and are grouped as a common mass without orderly arrangement. This embryo-forming mass is clearly defined from the surrounding auxiliary elements. On its ventral side it is separated from the cavity of the blastocyst by a thin membranous layer of primitive endoderm cells. The latter resemble the other auxiliary elements. They are definitely more differentiated than the cells of the embryo mass and so cannot be derived from the latter.

The most conspicuous characteristic of the 9-day blastocyst is its distended thin wall, a multicellular trophoblastic

film. This organ, if we may speak of such an evanescent membrane as an organ, is characteristic for all mammalian eggs. The amount of its distention, however, varies in correlation with the character of implantation. For instance, the blastocysts of the rabbit, pig and monkey, which are not wholly or not at all interstitial in their implantation, are markedly distended; whereas the blastocyst walls of the guinea pig, rat and mouse, which are interstitial, remain relatively thick.

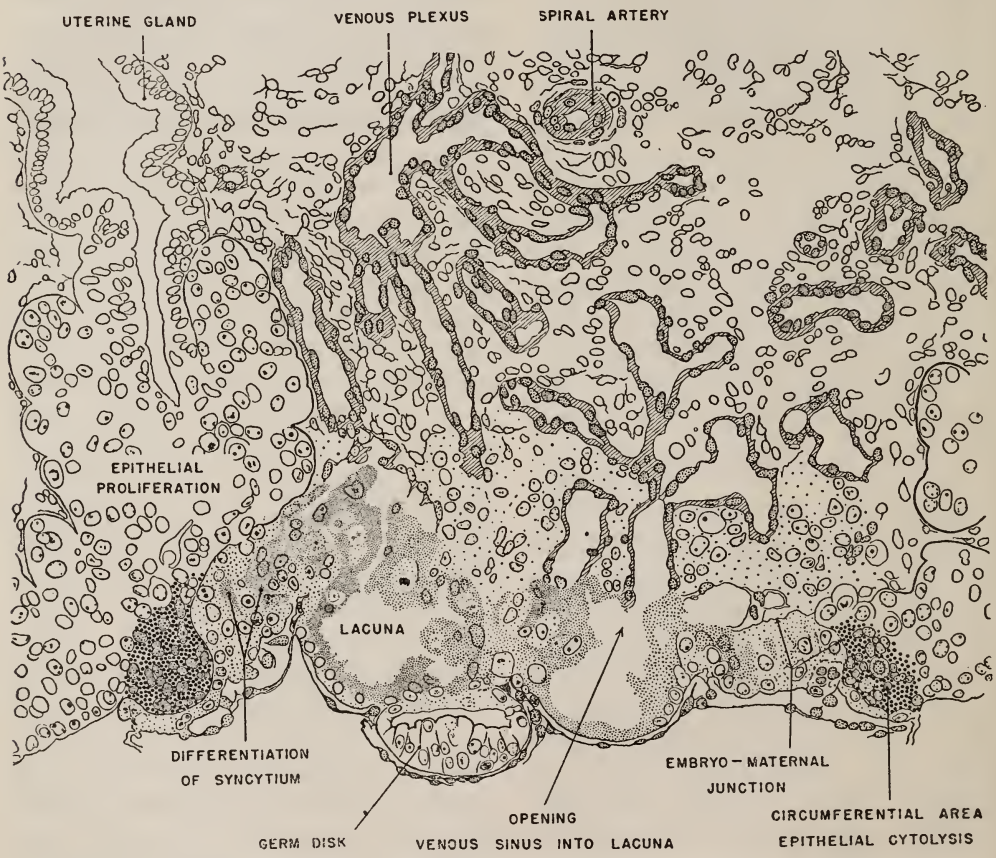
The blastocyst form is not to be thought of solely in terms of the next succeeding stage of development. It is to be remembered that at all stages the embryo is a living organism, that is, a going concern with adequate mechanisms for its maintenance at each level of complexity. The embryo not only develops, but also lives. Business is carried on during alterations. One can therefore regard the thin trophoblastic wall of the blastocyst as a functional membrane adapted to the immediate needs of the organism, as well as being endowed with particular potencies for the formation of new tissues when these are called for by subsequent changes in the environment. It is conceivable that, if we could arrest the developmental factors, the blastocyst might maintain itself indefinitely as long as the environment remained constant.

Implantation, which now follows, is shown in *figs. 5–7*. The three-germ-layer doctrine explains nothing for us here. Instead, we have the functional phenomenon by which the trophoblastic cells at the embryonic pole simultaneously invade and cytolyze the uterine epithelium. This begins at isolated points which promptly spread and become a common invasive plate. As can be seen in *figs. 6 and 7*, the net result of this process is that the uterine epithelium of the erosion area is transformed into embryonic trophoblast and the latter is correspondingly increased in mass. In *fig. 7* the trophoblast has come in contact with the uterine stroma, closing in the aperture as the erosion progresses. Around the margins of the invading plate additional epithelium is being cytolyzed, shown by its dark stain. This in turn is added to the trophoblastic mass and correspondingly contributes to the growth of the ovum. It is to be noted that during the day or two when these things are happening the blastocyst loses the fluid from its cavity and becomes flattened against the uterine surface. Later, it again becomes distended and thereon the abembryonic pole attaches to the opposite wall to form a secondary placenta.

As the trophoblastic invasion plate enlarges, one sees an immediate response on the part of the uterine capillaries. This is illustrated in the accompanying *text fig. 1*. It will be seen that the trophoblast takes the form of lacunae, predecessors of the intervillous spaces. The capillaries open directly into these lacunae, filling them with maternal blood and thereby contributing plasma and red cells as nourishment to the voracious trophoblast. Arterial blood is restricted to the spiral arteries, which terminate in thread-like communications with the venous plexus. Later, as the implantation becomes established, the arteries appear to empty directly into fetal territory and thereon an active circulation of maternal blood through the intervillous spaces becomes established. We will go no further here with implantation and fetal-maternal relationships. It is sufficient to recognize that the trophoblastic wall in these early stages serves both as a container and a functional membrane that supplies and maintains a suitable culture

medium in which is bathed that important cluster of cells that is to form the embryo proper. We will pass on and see if the three-germ-layer theory is of help in the understanding of the immediate factors in the organization of the embryo itself.

primitive and have undergone less specialization than any other part of the ovum. They represent more nearly the original germ plasm and, like it, are relatively totipotential. They and they only are capable of making an embryo. They constitute the residuum of the original




TEXT-FIG. 1. IMPLANTATION SITE OF THE MACAQUE EMBRYO AT THE END OF THE 10TH DAY

The trophoblastic plate has eroded the uterine epithelium and is in direct contact with the highly vascularized stroma. Around the margins of the trophoblastic plate at its junction with the uterine epithelium, the latter shows marked cytolysis (coarse, black stippling). The rich venous plexus opens at numerous places directly into the lacunae. The spiral arteries, on the other hand, terminate in slender communications with the venous channels and do not yet pour directly into the lacunae.

### GERM DISK, AMNION AND YOLK SAC

On the ninth and tenth days, the embryo-forming cells are grouped in a common mass at the embryonic pole and are quite distinct from the neighboring auxiliary cells (*figs. 4–7*). They are more

one-cell egg from which the auxiliary elements have been segregated as specialized tissues to perform their particular functions.

On the ninth and tenth days it is too early to speak of the embryo-forming

cells as embryonic ectoderm. Instead, they are the common stock from which all embryonic tissues are to be derived. The beginning of their active proliferation and specialization can be seen in *fig. 8*. Having been haphazard in arrangement, they now unite in making an orderly germ disk as seen in *fig. 9* and from this time on we begin to find evidences of an anteroposterior axis. The cleft between the germ disk and overlying trophoblast is the predecessor of the amniotic cavity; in this case, an amniotic cavity without an amnion. The tardy amniogenic cells constitute the lower tier of trophoblast cells along the margin of the cavity which have not delaminated yet. They are doing this, however, in *fig. 10*, an 11-day specimen, and their detachment and transformation into a membrane progresses in *figs. 11–13*. It is thus clear that the amnion is differentiated and delaminated from the trophoblast, and that it is an auxiliary structure which, like the placenta, is discarded at birth.

If we accept the principle that temporary embryonic organs are adapted to the functional needs of the embryo at the proper time, and if the yolk sac is accepted as one of these organs, then it is not surprising that we should find many forms of yolk sac, just as there are many forms with their divergent requirements of vertebrate embryos. We are here dealing only with the macaque embryo and in this animal the story is a clear one. The yolk sac first appears at about the 12th day (*fig. 11*) and the succeeding illustrations trace it to the 17th day (*fig. 16*). It is different in origin and at all times abruptly demarcated from the primordium of the gut. The two, however, are continuous around their accurately adapted rims and they share a common cavity. Something must therefore be said first about the gut.

Going back to the organization of the germ disk, when its cells begin to actively proliferate two things happen; there is an increase in the size of the disk and, what is more important, certain new specialized cells make their appearance and become set off from the original primitive cells of the disk. The latter is then spoken of as the primitive streak and around its margins skin ectoderm and neural ectoderm spread outward. Now for the first time we have definite embryonic tissue types possessing limited potentialities according to their particular type. In such a way, the cells that are to form the primordium of the gut acquire specialization and appear to migrate ventrally from the germ disk to join the primitive endodermal membrane, which from the eighth day on has screened the embryo-forming cells from the cavity of the blastocyst. The immediate effect of the swarming down or delaminating of these specialized cells is the creation of a thick cellular plate that underlies the germ disk (*figs. 11–14*), a secondary disk from which the gut and its various appendages are derived. They are usually spoken of as endodermal derivatives but must not be confused with the primary endoderm of the earlier stages. About the 17th day (*figs. 15 and 16*), the gut primordium breaks apart into cells that are to line the gut tract (definitive endoderm cells) and others that are to form the elements of its walls (mesenchyme). Two other prominent ventral delaminations from the germ disk, comparable to that of the gut primordium, will follow later. They are the head-process cells (notochord) from the primitive knot and the mesenchymal cells from the more caudal-lying primitive streak. During the laying down of the gut primordium sections like those shown in *figures 11 and 13* are commonly found.

Returning to the yolk sac, we find it

present in *fig. 11* as a thin membrane marking one border of the cleft between it and the gut primordium. This is its earliest appearance. The cells that had formed a single layer of primitive endoderm, on the ventral surface of the germ disk, have proliferated and rearranged themselves; some have taken the form of a separate exocoelomic, mesothelial-like membrane; others appear as a loose reticulum between the exocoelomic membrane and the trophoblastic wall and the embryo. The reticulum shows a tendency to secondary spaces and minor membranes. It is in the latter category that the yolk sac must be placed, but under the stimulus of the germ disk and gut primordium it undergoes a characteristic form and growth. In *figure 12* it has become a definite structure, strikingly different from the gut primordium, and its cells retain their resemblance to those of the exocoelomic membrane. In 17-day yolk sac (*fig. 15*) its wall is supplemented by additional reticular cells tending to make it double-layered. From this time on, it rapidly expands and by the 20th day has become a large, highly vascular vesicle on the top of which the embryo rides, with a rich vascular plexus communicating between the two. As the yolk sac reaches maturity the exocoelomic membrane disappears and we may assume the latter has been supplanted by the former.

## CONCLUSION

In order to extend to the higher primates the processes of embryogenesis seen in the monkey, two very early human embryos[10] are being shown in *figures 17 and 18*. It will be seen that the human has much in common with the macaque. The germ disk is almost identical in the two genera. It is this disk that is to become the embryo. Its nourishment at first is provided, as in a tissue culture, by the other cells of the ovum. These trophoblastic or auxiliary cells fall into two groups: the outer syncytial group, which forages on the maternal tissues; and the inner reticulo-membranous group, which conditions the acquired nutrient fluids so that a tissue culture medium having precisely the right ingredients is supplied for bathing the embryo disk. As the embryo develops, supplementary devices become necessary (e.g., yolk sac). Eventually, by acquiring an efficient blood circulation the embryo equips itself for the great increase in size and complexity of its later stages.

It is hoped that the sample illustrations that accompany this paper will convince the reader that the structural elements that underlie the early physiology of the primate embryo can now, in large part, be demonstrated under the microscope. We certainly must conclude that the amnion and yolk sac are not simply mechanical foldings of homogeneous membranes, as predicated by the three-germ-layer doctrine. Instead, they arise by a developmental mechanism characterized by segregative individuality of cell-masses and inductive interactions of cell-masses upon each other, all directed toward response to the physiological requirements of the embryo as these change from stage to stage. Scant room is left for diagrams of ectoderm, mesoderm and endoderm.

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[10] Hertig, A. T., and J. Rock. "Two human ova of the previllous stage . . ." *Contrib. to Embryology*, vol. 29, Carnegie Institution of Washington, Pub. No. 525, 1941.

Plates 1–3

PLATE 1

Fig. 2. Surface view of an 8-day macaque blastocyst. Enlarged ×300.

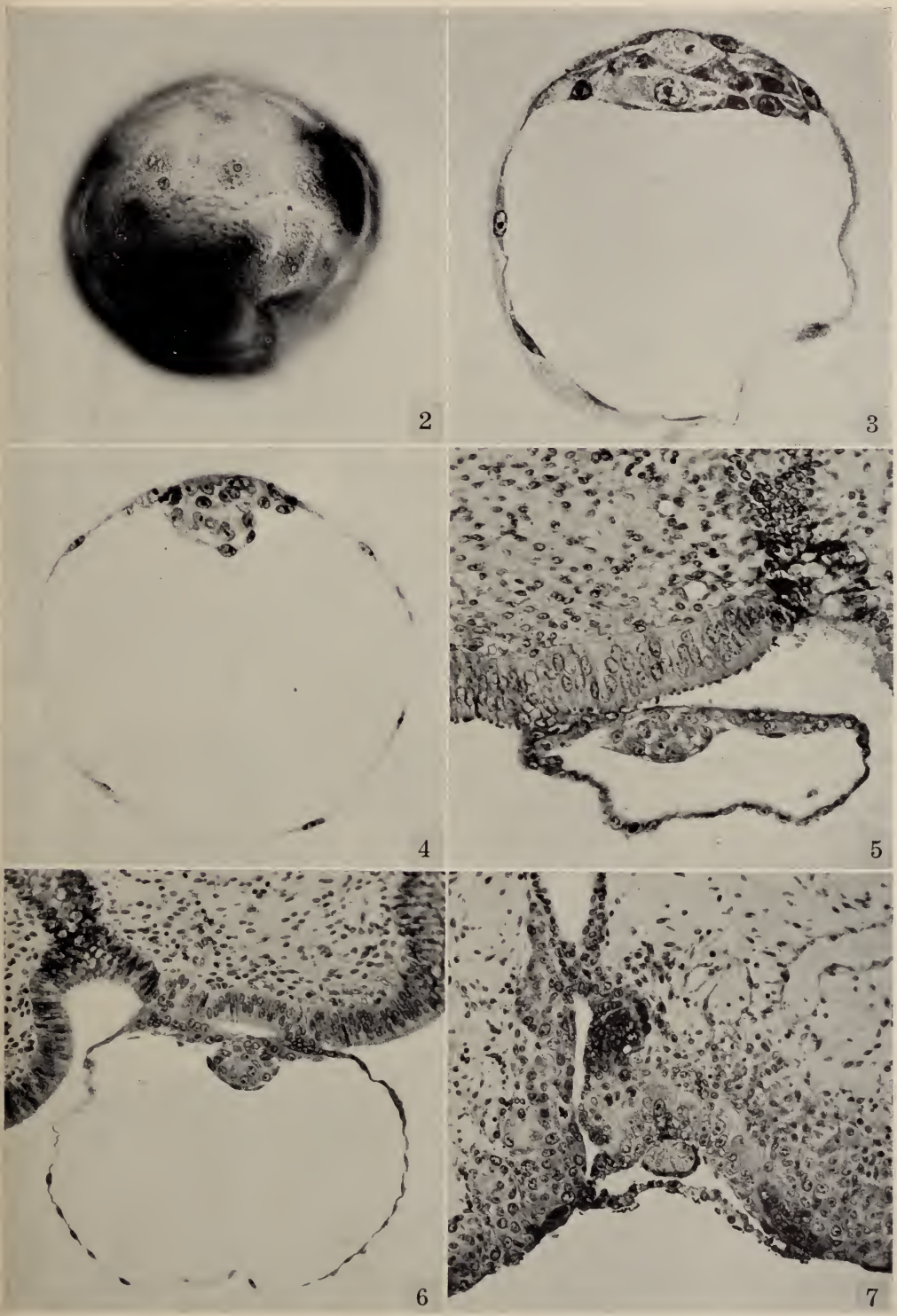
Fig. 3. Section through same blastocyst showing character of the various cells at the embryonic pole, the two large ones being embryo-forming cells. Some of the zona pellucida is still present. Enlarged ×400.

Fig. 4. A 9-day blastocyst about ready to attach. The trophoblast at the embryonic pole begins to show a syncytial surface ready for attaching. The embryo-forming cells form a discrete clump separated from the cavity of the blastocyst by a membrane of primitive endoderm. Enlarged ×250.

Fig. 5. Another 9-day blastocyst partially attached to the uterine epithelium. At such points there is beginning cytolysis of the epithelium, the nuclei being more resistant than the cell bodies. At this stage the ova tend to flatten against the epithelium. Enlarged ×250.

Fig. 6. An 8- to 9-day blastocyst showing more areas of attachment, with more advanced cytolysis of the uterine epithelium at point of contact. Enlarged ×150.

Fig. 7. In this 10-day specimen the ovum has flattened against the uterine wall. The invasion plate has eroded through the epithelium and is in contact with the stroma. The dark areas of uterine epithelium show advanced cytolysis and are being rapidly consumed by the invading trophoblast. The proliferation of epithelium around the neck of the uterine gland is a characteristic hormonal response. Enlarged ×150




Figs. 2–7

PLATE 2

Fig. 8. Proliferation and beginning orientation of germ disk cells. Trophoblast overlying it contains clumps of incompletely assimilated maternal epithelium. The ovum being in the collapsed state, its single-layered abembryonical wall can be seen in the photograph. Enlarged ×500.

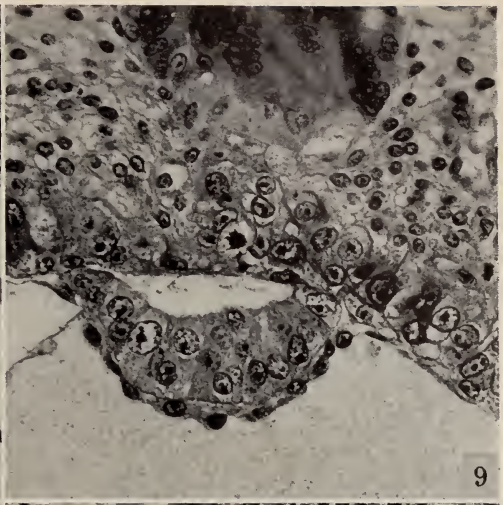
Fig. 9. Well oriented germ disk in a 10½-day specimen. The amniogenic cells will soon differentiate from the lower margin of the trophoblast cells. Enlarged ×300.

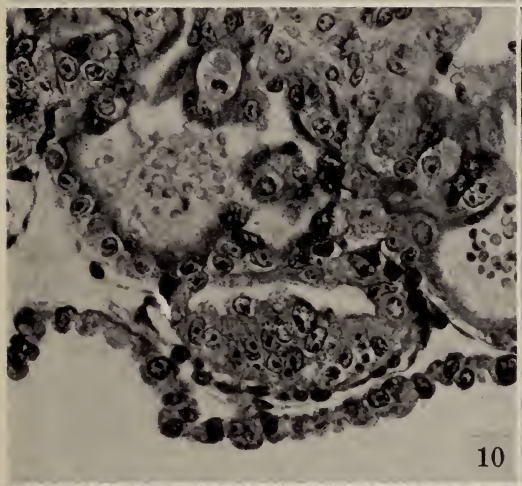
Fig. 10. An 11-day specimen in which the amnion is being delaminated from the overlying trophoblast. The ovum is still flat against the uterine surface and the abembryonic wall is separated from the germ disk only by the sheet of primitive endoderm. Note the maternal blood in the lacunae where it is assimilated by the trophoblastic syncytium. Enlarged ×300.

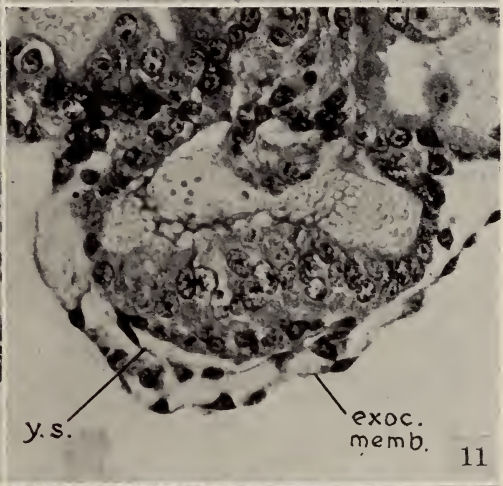
Fig. 11. A 12-day specimen, showing first appearance of yolk sac (Y.S.). At the same time there appears to be a ventral migration of germ disk cells which results in the formation of the gut primordium. The amniotic cavity is filled with maternal blood, as frequently happens. The amnion being derived from the trophoblast, it is not unusual to find open communication between the amniotic cavity and the trophoblastic lacunae. Enlarged ×300.

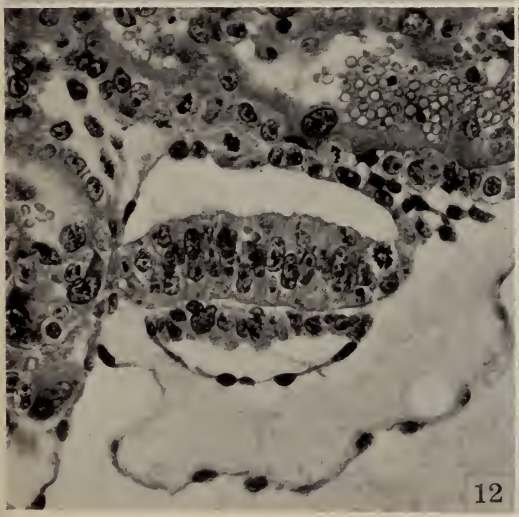
Fig. 12. An 11¾-day specimen, showing the difference in character of the gut primordium and the yolk sac. Enlarged ×300.

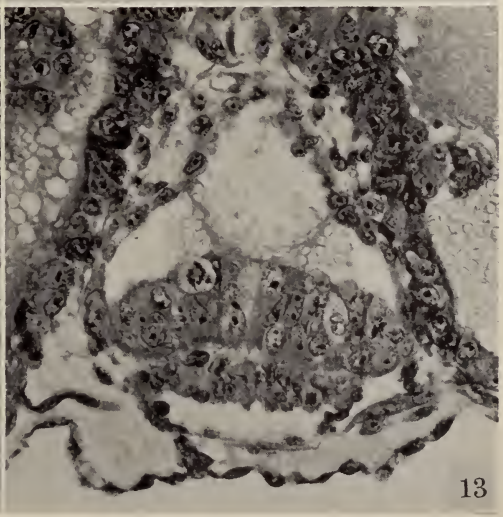
Fig. 13. From the right half of the germ disk, in this 13-day specimen, there is the appearance of migration of more cells to be added to the gut primordium. Enlarged ×300.



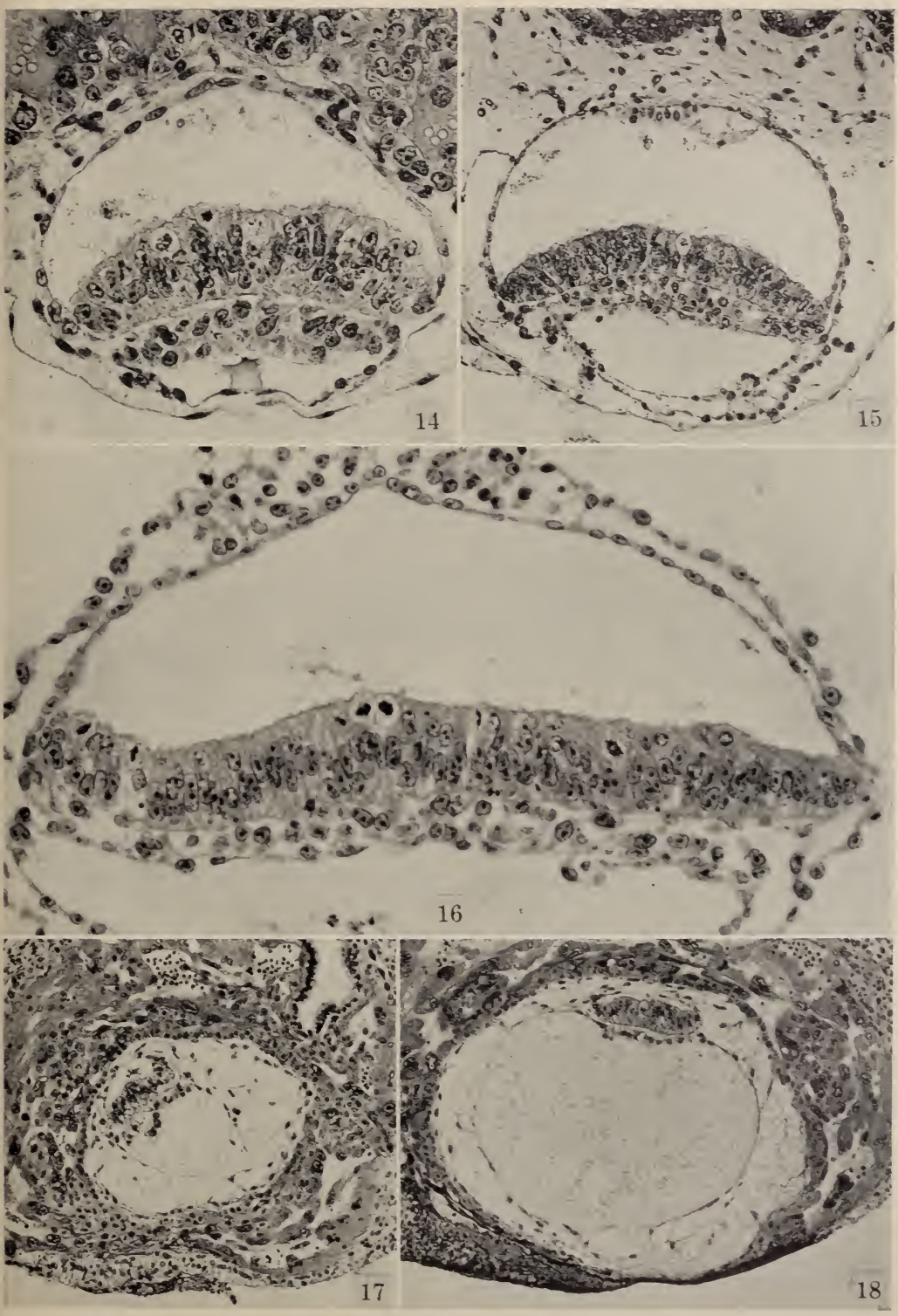

Figs 8–13

PLATE 3

Fig. 14. A specimen a little over 13 days, showing the gut primordium as a thick plate underlying the germ disk. It is sharply demarcated from the yolk sac and is quite different from it in the character of its cells. A coagulum is seen in the center of the joint cavity of the gut and yolk sac. The thin membrane below the yolk sac is the exocoelomic membrane whose disappearance occurs about the time of full differentiation of the yolk sac wall. Enlarged ×300.

Figs. 15 and 16. Two 17-day specimens, marking the resolution of the gut primordium into diverse tissues. The ventral cells spread out as the gut endoderm and the more dorsal cells become the other elements of the gut wall. Thus when the gut primordium comes away from the germ disk it brings its mesoderm as well as endoderm, providing we use those terms. Fig. 15, ×150; fig. 16, ×300.

Figs. 17 and 18. Two human ova (Hertig) approximately 11–12 days old. These are introduced to show their close resemblance to macaque embryos. In each of them can be seen the important germ disk that is to constitute the embryo, whereas the remainder of the ovum, that is, the auxiliary part, constitutes a tissue culture chamber in which the proper nutrient medium is provided and accurately conditioned for the growth and differentiation of the germ disk. Enlargement ×100.




Figs. 14-18

# The Way of Public Health*

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ORGANIZED communal effort to combat impending pestilential disease is no product of recent years. True, the process has been streamlined, and the significance of positive health promotion has extended into the thinking and daily habits of most sensible individuals. History is replete with conjecture regarding the natural phenomena concerned with sickness and health. Until recent generations illness of an individual was esteemed an event entirely fortuitous, an inevitable evidence of Divine displeasure which could not be foreseen, anticipated or averted. The death of multitudes in the early decades of life was adjudged as a part of the order of nature. To the occasional philosopher it presented an interesting phenomenon to be diligently investigated and rationally explained. To Descartes is accredited the statement that if man is to reach the highest possible status of development physically, intellectually and morally, he must have the aid of scientific research and discovery. Whether this great French philosopher ever made such a statement or not is of small importance. There have been wise men at different periods in history who have held that one of the highest functions of mankind is to interrogate nature, ascertain her secrets, and use them so far as can be done in improving the conditions of life. The early Greek philosophers recognized the desirability of knowing our environment as thoroughly as possible and adjusting ourselves to the conditions of nature.

When Franklin was playing with his kite, the story goes that someone asked him of what use his observations would be; he replied by asking, "What is the use of a newly born babe?" No one knows into what he may develop. It is needless to call to your attention the monumental progress in the arts and sciences which Franklin's simple discovery has yielded. The laws of health and of disease in living organisms are as fixed and invariable as in abstract science are those of mathematics. Through the ages the physician has been challenged by the fundamental philosophy of medicine established by Hippocrates and his colleagues, who recognized disease as a part of the processes of nature, and not as an instrument of Divine wrath inflicted upon the faithless. With sound sense, the Greek Father of Medicine said that when large numbers of people fall ill simultaneously, the cause must be sought in that which is common to all. Thus was established the theorem of cause and effect, as a substitute for mere conjecture and speculation. Exact observation and experimentation have replaced mere supposition. The physician, with the aid of his colleagues, the chemists and the physicists, has pursued scientific investigation on a sound epidemiologic basis. The study of localities, their topography and constitution, the movement of population, and social trends in relation to the travel of contagion, preceded by many centuries the discovery

* James M. Anders Lecture XVII, The College of Physicians of Philadelphia, May 7, 1941.

of the specific causes of disease. The mode or modes of disease spread in relation to the life habits of man were observed among the travel-worn pilgrims and faithful sojourners to the shrines of the Far East. Thus, at an early day there was recognized a principle that people are not predestined to famine and pestilence inflicted as a result of religious displeasure, but each new wave of terrifying epidemic results from exposure to environmental or personal factors which are not beyond the grasp of human control.

Organized medicine in our own country at an early time accepted the challenge to study illness in relation to the inanimate and personal factors. The American Medical Association, at a meeting held in Baltimore in 1848, appointed a committee on public hygiene. This committee studied the characteristics of the early American town and city, its population and its relation to the surrounding country. It concerned itself with existing arrangements for drainage, the disposal of municipal and human wastes, the cleansing of streets, and natural ventilation of the densely populated parts of our communities, adequacy of hospitals, dispensaries, and the system of public schools and their influence upon health.

During the summer months of 1864, under the direction of Dr. Stephen Smith, with the aid of a group of devoted young physicians who volunteered their services, a city-wide sanitary survey was made of the New York metropolitan area. This survey and the facts disclosed paved the way for the passage by the New York State legislature in 1866 of the Metropolitan Health Law, which has formed the very backbone of public health administration in the United States. There were found removable and avoidable causes of disease around and within the dwellings and places of business of that great metropolis. The investigators declared that errors in the mode of living tended toward unnecessary illness, and that these errors which vitiated the health of the citizens could be eliminated and changed by the expenditure of human energy and through the creation of a community-wide agency whose obligation it would be to enforce the removal of conditions inimical to the public health. Here again, the student of medicine individually and collectively through organization accepted the challenge that insanitation with the accompanying needless distress, illness, and premature death of the masses was a result of man's ignorance and apathy, rather than a discipline of nature herself.

It was the medical profession which supported state legislation resulting in the creation of eight state boards of health during the six years from 1869 to 1875.[1]

In the spring of 1872, a group of men interested in preventive medicine and sanitary science assembled in New York City and organized the American Public Health Association. The Secretary, in his "Introductory Note", stated that "membership is secured upon the basis of personal devotion to sanitary studies and their practical application." The founding by medical men of an organization which for sixty-nine years has provided a forum for the discussion of sanitary problems and which, through its innumerable committees, has contributed generously to the advancement of community-wide health programs, is another evidence

[1] The first state boards of health were established in Massachusetts (1869), Louisiana (1870), California (1870), Virginia (1872), Minnesota (1872), Michigan (1873), Maryland (1874), Alabama (1875). In Alabama the State Board of Health is by law constituted as the State Medical Society.

of the physicians' desire to provide country-wide application of knowledge and service for the removal of contagion and the promotion of positive health. One of the Assocation committees, as early as 1875, anti-dating by several years the disclosures of the great schools of Pasteur and Koch, was charged with the responsibility of collecting information with respect to the conditions of public hygiene in the principal towns and cities of the United States, and compiling laws and regulations relating thereto. Surveys were made in approximately 325 cities and towns of 5000 inhabitants and upwards. Emphasis was again placed upon the environment in its relation to health. The locality, its population and climate and topography, were studied in relation to water supply, drainage, sewerage, the cleanliness of streets and public buildings, manufacturing establishments and trades, hospitals and the like. Today, in retrospect, we are naturally impressed by the great emphasis placed by these pioneer sanitarians upon environmental factors, but in so doing, in the absence of the exact science of bacteriology, these early healthmen were merely accepting the challenge of the Hippocratic school; they were substituting observation and reason for speculation and intuition which had prevailed for so many centuries, influencing the writings of such great philosophers as Plato, Galen, Bacon, and Sydenham.

During the nineteenth century modern preventive medicine, with the application of scientific discoveries to the control and cure of disease, developed rapidly. To this beginning, the twentieth century has added noteworthy support through the discoveries of our great scientific institutions and the contributions of the medical practitioner. That preventive medicine has added years of strength and efficiency to mankind is admitted by all. When this century opened, the expectation of life at birth was slightly in excess of forty-nine years; by 1938 this figure had increased to nearly sixty-three years—approximately fourteen years added by improvements in personal and environmental health. The epidemiologist is impressed by the fact that much of the knowledge which enables us to boast of the great reduction in morbidity and mortality has come from individuals who have worked independently of highly organized and subsidized laboratories, frequently under rather primitive circumstances; many have been engaged in the practice of clinical medicine.

We have witnessed the phenomenal drop in the death rate from tuberculosis, a death rate less than a third of that which existed at the turn of the century. We observe some rural communities in which the few remaining cases of tuberculosis have become objects of medical curiosity. The crusade against tuberculosis has been eminently successful. Formerly a leader for all causes, it now stands in eighth place and can be driven back even further. We do not suggest that the combat with this age-old foe of mankind has been completed. Although displaced by heart disease, cancer and pneumonia at the summit of the causes of death (for all ages), in the very prime of life (from twenty to thirty-five years) tuberculosis still ranks first as a cause of death. We must continue the attack with the same vigorous attitude with which we confront smallpox or diphtheria. A reduction in the death rate from tuberculosis in the United States of over seventy per cent. in the past thirty years by no means completes the story. Ruffer, working in Egypt, demonstrated the presence of tubercle bacilli in the carious vertebrae of mummies, thus showing that this or-

ganism had become a parasite of man when the race was still in its cradle. The disease has become an accompaniment of civilization, harasser of mankind as he abandoned his nomadic life for the urbanized necessities of the industrialized and commercialized age. To wipe out the lingering remnants of this scourge is distinctly within the field of human possibility. If the race is to survive, this universal foe must be conquered.

It was the French army surgeon, Villemin, who, several years before Koch, through his painstaking work, found the active agent of this disease, and fed guinea pigs and other animals on tuberculous sputum. He not only fed them but he introduced this infected material into the bodies of these susceptible animals in various ways and learned that in all cases tuberculosis developed. He introduced other foreign bodies and found that in no instance did tuberculosis result. In this way he showed that the secretions from tuberculous lesions contained the micro-organism which causes tuberculosis, and that it is found nowhere else. Based upon the observations of Villemin, at least one American state board of health began to teach the common people of the state, through a published primer on hygiene, which was used in high school physiology classes, and through the coöperation of the family physician, that tuberculosis was a communicable disease, and that for each new case there was a preceding infecting case from whom the seeds of contagion were disseminated. Thus did keen application of a scientific mind to a study of cause and effect result in interpretation and application of newer knowledge through the coöperation of the family physician and by the establishment of suitable health administration channels. Little did Villemin, working in 1865 on the transmissibility of tuberculosis from one animal to another, appreciate that he was the founder of modern knowledge concerning this disease and that the fruits of his labors, combined with the studies of Robert Koch, Theobald Smith and others, would find expression in the services of family physicians throughout the civilized world, who labor unceasingly to cut the chain which transports infection from family to family. Less than 60,000 deaths from tuberculosis were recorded in the United States in 1940, compared with over 90,000 deaths in 1929, when the population was significantly smaller. What a testimonial to the tireless energy of the research worker and to the wisdom of the physician who translates these products of scientific precision into preventive health services for the masses!

The family physician has ever been alert and ready to take full advantage in the application of the newer knowledge for protection against disease and unwanted illness and for the more positive promotion of a fuller life for mankind, unshackled from the impediments of physical and mental handicaps which hinder the normal development and usefulness of our people. It is he who effectively transfers the discoveries of our research institutions and centers of culture and learning into services available to the masses. The organized health departments have been keenly active in giving full expression to the means of suppressing environmental hazards, such as impure water, milk and food supplies, defective drainage, blighted areas with substandard housing, fever nests breeding epidemics and spreading the infectious diseases. These community health services have played their part in the dissemination of health facts which, when integrated into the daily habits of the growing child and

accepted by the adult in the eternal struggle for human survival, contribute so effectively to the fullness and wholesomeness of life. Notwithstanding these reasonable and warranted activities, supported in the main by tax funds cheerfully and eagerly appropriated by our elected officials, public health will never rise higher than the level of health established for the individual. The health of the many is but a summation of personal health. A nation can never be healthier than its citizens, and it is upon the welfare of the latter that our effort must be concentrated. A low tuberculosis death rate results from an accepted appreciation that tuberculosis is a communicable disease, attacking the susceptible following close and frequently prolonged exposure to some forgotten and neglected infecting case. The community with a low rate is one in which the average citizen recognizes that tuberculosis breeds tuberculosis, that to combat this pestilence requires an attack, not only on the part of the organized agencies, official and non-official, which establish diagnostic centers, hospitals, sanatoria, open window schools, health examinations for school children, pasteurized milk from tuberculin tested herds, and programs of public education, but also on the part of the individual who systematically and periodically reviews his own health habits in coöperation with his family medical counselor, who with test and x-ray will search for the danger signals, those early and remediable departures from normal health, and who will explore the nutritional, recreational and personal habits of his subject.

In the fight against diphtheria, more is needed than the health commissioner's declaration that children need not have diphtheria. Protection against this disease, as well as smallpox and typhoid, is a personal matter in any democracy which requires participation of the individual. It has been demonstrated repeatedly that in those communities where as many as two-thirds of the children of pre-school and school age have received their protective treatments, diphtheria ceases to be a major public health problem. Philadelphia's record, with no death in 1940, and but three deaths in the preceding year, affords evidence of accomplishment in a major metropolis. Diphtheria antitoxin was placed in the hands of the medical profession in 1895. The death rate of 97.8 per 100,000 population in the United States registration area may be regarded as representing the rate in pre-antitoxin days. By 1918 the rate had been reduced to 13.8, and since the use of toxoid has become general, the rate has continued its precipitous downward rush. In 1923 the rate for the eighty-eight largest American cities was 13.1; by 1939 it had dropped to 0.8 per 100,000 population. Who is strategically better situated than the family physician to carry the message of lasting protection to parents and children? It is the physician's obligation to render the advantages of such services to each and every family within his practice, and through example, extend the fruits of preventive medicine into all homes. The office of the family physician becomes a center of good health from which flows an ever increasing service in health education and action expressed in terms of periodic health examinations, x-ray examinations of the chest, immunizations, and encouragement to conserve and maintain the full advantages of a healthy people. There can be no artificial demarcation between the practice of curative and preventive medicine; both flow normally from the same professional source. The family physician becomes daily a more important

factor in the public health facilities of the community, and he has developed into a sort of deputy health officer, without whose coöperation and participation no great progress can be effectively created and maintained. It is the common purpose of both physician and health department to add to the satisfactions of a full and extended life. With common intent there need be no misunderstandings between these two life-giving institutions, as each has a distinct obligation to perform. There should be no substitutions one for the other, as teamwork and respect are the foundations on which advance depends.

Progress in the control of preventable diseases and the unreasonable mortalities of mothers and children is dependent largely upon the sane manner in which the laity receives, assimilates, and utilizes health knowledge, as well as the promptness and completeness with which the medical practitioner employs the new protective devices—vaccines, toxoids, sera, chemotherapy and education for health. Most individuals are resistant to any outside influence which tends to change behavior—be it a matter of politics, religion, or health habits. It requires the slow, prodding influence of education through the years to show us how we may live more sensible lives. There is evidence of a willingness to accept medical advice and service and speed up public health conservation. In some quarters there is much lay lethargy, elsewhere too little participation by the family physician. More general acceptance and universal application of preventive procedures will save enormous sums now expended by health agencies in education. The problem is in no small measure associated with a more general participation on the part of physicians and dentists, in making available the techniques of prevention, a more willing response on the part of the public to accept such services as are designed and intended to protect the health of all.

Thirty years ago health departments began the extensive organization of infant and child health services by the establishment of well-baby clinics and the employment of pediatricians (frequently on a purely voluntary basis) to teach the young mother how to feed and dress the child, provide an environment compatible with robust health and implant in mind and body habits conducive to the development of life in conformity with accepted social and moral standards. Under this impetus of the public agency, aided by friendly groups formed for the definite purpose of furthering an interest in child health, universal interest became focused upon the need of conserving these future assets of the nation; demand for preventive education and service developed concurrently with the physician's ability and desire to become a unit in this broad health program. Mortality in the childhood ages today is practically one-fifth of that prevailing thirty years ago.

The trend of the pneumonia death rate has been downward during the past two decades. One hesitates to place too much emphasis on figures unless there occurs some distinctive signal suggesting more than the frequently observed rise and fall of rates unrelated to specific methods of disease suppression. However, in the case of pneumonia, there has been no hesitation in this downward trend of the death rate curve since antiserum and chemotherapy became a part of the armamentarium of the physician. Health officers will give glowing accounts of spectacular accomplishments throughout the land. Some of these statements will be warranted by fact, as the pro-

gressive healthman will share in the process of public education, by placing laboratories for sputum typing at the disposal of hospital and family physician, and by securing public appropriations for serum and drug distribution to the necessitous. There is no intent to belittle these fundamental necessities and services of the health department, but the great country-wide, all-significant improvements in pneumonia morbidity will come as the physician, in home and hospital practice, succeeds in treating early cases of pneumonia promptly and with adequate dosage of therapeutic agent, and as the layman accepts the whirl of health education which bombards him on every side and complacently succumbs to the frequent admonition to see the family physician upon the appearance of the first danger sign.

Many progressive health administrators and officers of medical societies have come to realize that there exists in every community, whether urban or rural, a potential reservoir of medical knowledge and service which can be activated to serve the local needs. By stimulating these resources among practicing physicians and dentists, the spirit of health education can be made to permeate every home and provoke a response on the part of conscientious parents, so that they will do their share to secure modern health benefits for their children. A number of studies have been carried on during recent years with a view of increasing the active participation of practicing physicians. There is nothing in these studies which detracts from the essentialness of a properly organized and personneled local public health service. Active participation on the part of the family physician merely multiplies the number of places at which the services become available. The program should not be limited to one line of approach. It should not be considered merely an effort to secure the protection of all susceptible children against diphtheria, nor should it be an undertaking restricted to the search for the early case of tuberculosis. It must be broad in conception and application. It should embrace the gradual inclusion in medical and dental practice of services of a preventive character, which, in the final analysis, are available only at the hands of the duly licensed professional man. A program which involves the gradual transfer to the physician's office of services which in the past have been maintained directly by the health department in clinics, health centers and dispensaries (mainly for demonstration purposes), can not be placed in full operation in a short time. It is not a program of a few weeks or even a few months; it is a program of several years. It involves a change of attitude on the part of the health administrator, the physician, the organized medical society and the public. It is not a program which is revolutionary in character. It is the gradual evolution of a procedure embracing the practice of preventive as well as curative medicine by the family physician.

A successful program demands complete and sympathetic understanding between the professional group (usually the county medical society), the local health agency (usually the health department), and the public. The health department should serve as the executive unit to place in operation the plans as developed and adopted jointly with the medical society. Neither the county medical society nor the health department can function with maximum efficiency without the support of the other.

The membership of the medical society should be kept concurrently informed of the progress of the plan. There should

be a sense of personal pride in home ownership; however, the individual must be willing to subscribed to a form of procedure adopted by the organized medical group. The coöperation of a large number of physicians involves the establishment of postgraduate or refresher courses to acquaint the individual with the technics of the services which are to be rendered. As long as the physician believes that early tuberculosis can be diagnosed by such symptoms as fever, loss of weight and appetite, night sweats, and possibly hemorrhage, he will be of no assistance; but place in his hands the modern technics of preventive medicine—the tuberculin test, the x-ray examination, he will become a very potent factor in the discovery of minimal tuberculosis. Physicians who are not wont to attend medical meetings should be visited in their own offices by a medical coördinator—a physician representing both the health department and the county medical society. It would be disastrous to urge a parent to send his child of susceptible age to a coöperating physician for diphtheria protection if such physician were unconvinced of the value of prophylactic treatments or if he were not familiar with the technic involved. Months of preparation of the profession may reasonably precede any effort to stimulate public interest. Fortunately, most physicians believe wholeheartedly in continuing self-education.

After the profession is thoroughly conversant with the group plan, the problem resolves itself into one of encouraging the adult, or the child of susceptible age, under the proper conditions and circumstances, to visit the family physician in his own office. Here are needed the tools of health education. The layman must be stimulated to accept his obligation and to secure for himself or his children the services which the coöperating physician is ready and willing to provide in his office. The mere presentation of facts is not sufficient; the individual must be stimulated to action; a change in behavior must be established so that he will seek service from his physician. This demands the pooling of all the interests in health education. Every individual and agency, from the family physician and dentist to the teacher, the newspaper editor and the preacher, must be integrated into the program. Health departments are accustomed to employ popular education, the printed and spoken word, visual methods—the radio, radio drama, billboard advertising, streetcar and motorbus placards, literature distributed through the schools and elsewhere. The public health nurse who has received special training in health education, and who at the same time is conversant and sympathetic with the attitude of the medical practitioner, becomes a very potent connecting link between the parent, the child, and the family physician. It is largely through her efforts that the newer facts of preventive medicine can be presented to the average citizen.

The principles of such a program of medical participation have been employed under varying degrees of limitation in many cities and counties throughout the country, and generally with a degree of success commensurate with the amount of enthusiasm and energy displayed by the local health officer and the officers and members of the medical society. The program has been used in the attack upon the remnants of diphtheria and smallpox, the residue of tuberculosis, the more recent concerted drive against syphilis, and for the improvement of the general health and physical condition of school children and adults employed in industry. The plan continues to focus

attention upon the great blessings which have come from the handiwork of the family physician and the additional contributions which this too-frequently underrated individual has in store for human good.

In 1928, in coöperation with the Wayne County Medical Society, the Detroit Department of Health inaugurated a plan for medical participation, under the terms of which no diphtheria protective treatments were to be given in clinics or health centers operated by the Health Department, or any other health, social, educational, or welfare agency. During the past eleven years, all such treatments have been administered by the family physician, or at least by a physician of the family's own choice. The percentage of children protected has continued to increase, and it is known that fifty-two per cent. of infants have received their toxoid by the time they reach the age of eighteen months. Nearly seventy per cent. of the pre-school group is protected.

Throughout the program, the Health Department has provided a small fee for the physician in instances where the family was unable to meet the cost. Each year there has been an increasing willingness for parents to pay their own physician the fee of one dollar, which is usually the charge for each protective treatment given. Four out of every five treatments are paid for by the family. The Health Department compensates the physician in only one fifth of the instances. This conforms closely to the number of Detroiters who normally receive some form of welfare service.

Subsequent to 1928, the program in Detroit has been extended to include smallpox vaccination, tuberculin tests and x-rays for positive reactors, treatment and supervision of syphilis, and physical examinations and preventive services for children about to enter school. Now, about thirty thousand entering school children present themselves annually with a report showing the results of a physical examination made by the family physician; more than two hundred thousand preventive medical services have been given by the family physicians annually in their own offices, and reported in writing to the Department of Health.

The entire medical and dental program of the W. K. Kellogg Foundation, as applied in seven typical rural counties in the Southwestern part of Michigan, is based on the same principles of professional participation. The cordial and intimate relationships between the physicians, dentists, and their patients is maintained, with satisfaction to each, and with spectacular improvements in the health status of the child population. These studies, as well as those in Detroit, have been described and discussed in detail elsewhere.

The monumental contributions made by the physicians of Pennsylvania through the State Medical Society embrace the same basic principles which are serving effectively in the furtherance of public health activities in many communities throughout the country.

In the fight for life there is work and credit for all—the physician who conscientiously combines resourcefulness with limited diagnostic and laboratory means in general rural practice, his urban cousin who feels the added strength of neighborly specialists, technicians and laboratorians, the physician who devotes his life effort to the establishment and maintainance of a modernly organized community health service. All can properly share in the public approbation of a job well done. Never in the history of our country has there been a time with greater need for coöperation, understanding and

partnership among those individuals and groups concerned with the health of our people. There is need of consolidation in the interest of national defense. Total warfare tolerates no unnatural divorcement of civil from military life. Epidemics which harass the one will surely obstruct the other in its effectiveness. The drain upon trained personnel in public health and medicine demands further unifications on the front against disease. The protection of the people's health is paramount in any defense program. The removal of all barriers, whether in terms of epidemics, nutritional deficiencies, lingering physical or mental obstructions, is the first obligation of all healthmen. The playfields of yesterday have become the battlefields of today. As a back log for the military, industrial and civil health must be kept at high level. Smugness in the satisfactions of past accomplishment will never serve the preparedness for the future. The fight against disease is a collective struggle against the devastating assault of morbidity and mortality, which relentlessly sap the vitality and usefulness of our people. The conservation of health is not only the first duty of statesmen, but the fundamental obligation of every physician and public health officer. The success of modern methods for closing all the insidious avenues through which infection has hitherto effected its entrance in the community, lends encouragement to the hope that the time is coming when disease itself shall be completely extirpated, and men shall begin to live out the days which Heaven intended.

# An Hermetic Plague-Tract by Johannes Mercurius Corrigiensis

*Text, Translation, and Bio-bibliography of the Author**

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## PART I: TEXT AND TRANSLATION

### INTRODUCTION

ANY corpus of medical writing that derives in part from mass interest in the given subject exerts a peculiar fascination on the student of history—because one finds therein, in addition to the varied scientific views, the popular views which wash around them, often retarding, sometimes advancing, their crystallization into a generally accepted doctrine, and at the least providing illuminating glimpses of the society for which the scientific struggle is being waged. The late 18th to early 19th century yellow-fever controversies in this country, for instance, generated an enormous literature, some of whose documents most highly valued by medical historians were the product of non-medical members of the community. Epidemics have an odd way of making the normally quiet vocal, and, where the power of speech stems from inward stress, the result is often eloquence of a high order.

The Mediaeval and Renaissance literature on the plague is another case in point. This dread series of epidemics touched in one way or another, it may be supposed, the life of everyone in Europe. As a result, a voluminous literature developed, in part medical, in part the expression of laymen representing all shades of culture, belief, and purpose. Thanks to the industry and scholarship of such historians as the late Karl Sudhoff, the still active Arnold C. Klebs and Dorothea Waley Singer, it is possible for us to study this richly human literature in some detail.

The plague tract that we re-publish here, from the only known copy, is a document the like of which is not to be found, so far as we know, in the printed plague literature. It stems neither from scientific concern with the epidemic nor from profound spiritual distress; it is, instead, a remarkably interesting vade-mecum of an itinerant and picturesque Italian charlatan, whose strange life and works, bridging the closing years of the 15th and the initial years of the 16th century, have recently been objects of study in several quarters. The author, who calls himself Giovanni Mercurio of

* A translation, with commentary, of this text appeared in the mimeographed *Fugitive leaves from the library* (of the College of Physicians of Philadelphia), 1935–36, *passim*. Portions of this material were used in an unpublished paper read before the Johns Hopkins Medical History Club, November 1, 1937. The translation has been revised since then, and the commentary completely re-written as a bio-bibliography in accord with new data brought to light in the last two or three years.

Correggio, has already been related indirectly, as will be seen in Part II of this communication, to the re-awakened interest in alchemy and occult philosophy at the close of the 15th century. This tract not only confirms the relationship, but presents itself as a forerunner of what we are accustomed to think of as 'Paracelsan' medicine. It clothes a weird amalgam of ordinary, hermetic, and alchemical medicine in the lurid literary style of a wandering evangelist. It gives, on the whole, a vivid, if rather terrifying, picture of a society held in subjection by superstition and belief in magic, though we know that even then there were minds shaking themselves free of dogma and superstition, and pursuing the light of free inquiry. It is well to remind ourselves that no age is scientific, cap-à-pied; that newspapers, magazines, and other publications of our own day freely advertise 'remedies' that, no less than those of Mercurius, ask for, and receive, a total "suspension of disbelief." These tides of ignorance and superstition recede slowly. Fortunately for the history of civilization, the edifice of scientific humanism rises a little more rapidly.

We present this tract, therefore, not as a document of scientific importance, but as one of some historical significance, nevertheless, in that it seems to represent an unusual type of plague literature and, at the same time, to foreshadow an important medical trend that, in the 16th century, was to find its most brilliant exponent in another itinerant evangelist, Theophrastus Bombastus ab Hohenheim, *dictus* Paracelsus.

It is perhaps advisable to say that our author's obviously superficial, undocumented use of theological and hermetic jargon, and of his medical sources, leaves rather more than the usual room for uncertainty as to the correct interpretation of some words and phrases. But the literal translation that accompanies his text does not misrepresent the 'spirit' of its contents, we hope, or any of the essential details. The great majority of the recipes are easily-recognized appropriations from the standard mediaeval medical literature. A few, of a more unusual character, seemed to require some reference to the literature, and brief notes have been supplied in these cases.

These notes will serve us again, when we come to consider in more detail the author's life and works, as we shall do in Part II, to be published subsequently.

¶ Contra Pestem: ac contrà omnem ipsius epidimie perniciosissimam contagionem: Preconium insigne: ex officinulla Jobannis Mercurij Lozigiensis affectuosissime excusum. Qui aût fur et iniquus est: temerario ipetu absq; vlla auctoris licentia hoc idem Imprimere faciet: Pesti lentia enim repentino et vlciscenti furore vorabit eum.

TUba. Tuba ingens: harmonicaq; et modulata: necnõ preconizatio verax. fidelis. et oi acceptione atq; mercede oigna: Qua ego eteniz: ego. s. Jobannes mercurius Lozigiensis (secundum exteriorem terrenũq; et aialem boiem) vir nãq; pauperimus: stultissimusq; vulgo: ac omni excessiua et miseranda calamitate oppressus: secundũ vero interiorẽ celestẽq; et spiritalẽ boiem: vir deniq; (per dei gratiam) triplici (terrena. s. celestiq; et diuina oipotentis Dei Arte. et sapientia preditus) medicusq; medicor: Quem creauit Altissimus: ac cui dedit vere medicine scientiã: Honorari in mirabilib⁹ suis: et in cõspectu magnator colaudari: Ego: ego ipse (non emperior iactantia: nõ sophistar falacia: nec vlla nephandi seu turpis lucri causa: Sed zelo ebatholice caritatis: ac diuina proximi dilectione fretus) ad sanctissime Trinitatis laudẽ: Curieq; Romane: ac totius huiuscemodi reipublice consolationẽ: de medicina quadam cõtra pestem: (tã ꝑ pauperib⁹. q̃ ꝑ diuitib⁹) mihi diuino spũ reuelatã (post ꝓcisus istius quidẽ resonantis et magne tube nostre clangorem) vniuersis. et singulis. ac quibuscũq; gentibus. linguis. et nationibus: necnon huic populo toti. sic palam. atq; preconizanti voce. loquor. et aio:

¶ Quicunq; in hac Alma. inclytaq; et celeberrima dei: sũmorũq; pontificum: ac mortalium Deor Ciuitate: habet aures. et oculos percipiendi. percipiat: et qui percipit intelligat: et qui medelam. ac medicinã ipsa a deo habere optat et cupit: ad me quidẽ cito. et confidenter (ex omni parte) concurrat: Cito. et ego quippe in signo. nomine. verbo. et spiritu Dei. dñi Jhesu Christi: medicinam ipsam. illi equilibranti lance. et larga manu. Impartiar. Medicinã loquor. Tyriacalem: Medicinã bezabardicam: Medicinã pauperũ. miraculosam. salutarem. et preciosa: pro qua nempe. si homo Mille daret argẽteos (credens sic eã mercede cõdigna soluisse) quasi nihil reputaret eã. Est vtiq; hec medicina (ipso volẽte deo) sui specifica. occultaq; ac sibi diuinitus collata proprietate: vinacissima pestilentie mors: eiusq;

A

AGAINST THE PLAGUE: AND AGAINST EVERY BALEFUL CONTAGION OF THE EPIDEMIC ITSELF: A PROCLAMATION EXTRAORDINARY: PHILANTHROPICALLY SENT FORTH FROM THE LABORATORY OF JOHN MERCURY OF CORREGGIO. BUT WHOEVER IS A THIEF AND INIQUITOUS WILL VERY RASHLY ATTEMPT TO PRINT THIS SAME WITHOUT THE AUTHOR'S PERMISSION. FOR THE PESTILENCE WILL CONSUME HIM WITH SWIFT & VENGEFUL FURY.

Trumpet! Mighty trumpet! harmonious and modulated: at the same time, proclamation veracious and reliable and worthy of complete acceptance at any price: by which I, truly, I, namely, John Mercury of Correggio, (following the outer, earthly, and animal man) poorest and dullest of men in most respects, oppressed by excessive and pitiable calamities of every sort; but, following the inner, celestial, and spiritual man, one endowed, finally, (through the grace of God) with the triple (namely, earthly, celestial, and divine) Art and wisdom of Almighty God; a physician of physicians, whom the All-Highest created and to whom he gave knowledge of the true medicine; to be honored in His miraculous works and extolled in the sight of the mighty: I: I, myself, (depending on neither the boastfulness of the empirics, nor the artifices of the sophists, nor for the sake of unspeakable or filthy lucre; but, rather, on the fervor of universal charity and the divine love of one's neighbor) for the glory of the Holy Trinity and the consolation of the Curia Romana and of all this here Republic, of a certain medicine against the plague (as much for the poor as for the rich), revealed to me by the divine spirit, (and after the sound of this resounding and mighty trumpet of ours has died away) to one and all, of whatever race, tongue, or nation, indeed to all this people, thus openly speak with a herald's voice, and I say:

Whoever in this exalted, glorious, and most celebrated city of God, the supreme pontiffs, and mortal gods has ears and eyes for taking heed, let him do so; and who takes heed, let him learn; and whoso desires and wishes to have a remedy and medicine straight from God, let him hasten to me quickly (from every direction) and with confidence. Quickly, and I indeed with balanced scale and liberal hand will share with him the medicine itself, in the sign and name, the word and spirit of God the Lord Jesus Christ. The medicine I speak of is a theriac, bezoardic medicine, a poor man's medicine, miraculous, health preserving, and precious beyond all others. If a man were to give thirty silver pieces (thinking thus to have paid a fair price for it), he would be valuing it at nothing at all. This medicine is (by God's will) a specific of its own, occult, with its peculiar nature divinely bestowed, a brisk death to the

perniciosissimi virus supermirabilis pestilentia: necnō cuiuslibet pestifere mortis. terribile fulgur: ⁊ exterminium. Cito. cito igitur: ac iterum vobis dico cito: o pauperes oēs ⁊ divites: Venite inq̃ vos quoscūq̃ pestilentie propemodū adventantis formido solicitat. nolite timere: ⁊ nolite metuere: nec expavescat. sed confortetur Cor vestrum: Quoniaq̃ (vt in sacra legiē pagina) Deus mortem non fecit: nec letatur in perditione vivoq̃: sed ad ymaginem similitudinis sue. inexterminabilem creavit boiem: ⁊ sanabiles fecit nationes orbis terrarum: Creavit. n. de terra. ipse altissimus (ad sanitatem gentium) medicinam. quā vir prudens. non abhorrebit vnq̃: Nam (vt oēs asserunt sapientes) Deus ⁊ natura. neq̃ habundant in superfluis. nec etiam deficiunt in necessarijs.

Note 1

Sumitur autem de miraculosa atq̃ sublimi hac pauperum medicina. a iam infecto (quam citius fieri pōt). ℥. i. ⁊ media cum tribus vnciis aque sancte. deinde. si opportunū esse videbitur. post horas octo: iterū secūdo. ⁊ tertio. de medicina ipsa ab eodem. vt prius. avide ⁊ alacriter. sumatur. Ita. s. vt in tempore. xxiiij. horarū. de eadem: si necessarium fuerit: ter potu diligenter suscipiatur.

Note 2

Quo facto. habeat infirmus hoc pro constanti. quicūq̃ fit ille. quod dempta plaga dei. ab omni alia fatali atq̃ truculentissima pestilentia. omnino ita evadet. ⁊ perfectissime liberabitur. Sed magnopere. advertendum est: q̃ infirmus. in tempore illarum. xxiiij. horarū. in quibus cura perficit̄. nullo pacto dormire. neq̃ cibum suscipere presumat. Preterea q̃ si in prima vel in secūda potatione medicine (eā naturali ⁊ regitiva regulāte virtute) per secessum. vel per sudorem. vel per vomitum. materia. morbi. ab infirmo tantū evacuetur. q̃ videatur sufficere: Tūc infirmus. ab eiusdem medicine iterata potatione. desistat: et ad se reficiēdum. restaurandūq̃. cum melioribus cibis. quos habere potest. se convertat.

Si vero signum aliquod. in aliquo mēbro. corporis infirmi apparuerit, mox cum scabiosa: vel cum cōsolida minori. inter duos lapides vinos bene contritis. apostemata optime emplastrentur. Quoniam. ipse quidem herbe sic (sui quadam supermirabili proprietate) antracem. sive Carbunculum occissime mortificabunt ⁊ destruent.

Note 3

Hoc idem de Cinoglossa. i. lingua Canis similiter contrita ⁊ superemplastrata dicitur. Et idem de morsu dyaboli.

Item Betonice aquatice. i. herbe Horiib. aut saponarie folia cū floribus suis cōtusa. ⁊ supposita: vt fertur a fide dignis. cōfessim: vel apostemata

pestilence, supermiraculously pestilential to the plague's most baleful virus and to all forms of pestilential death a terrible thunderbolt and expulsion. Quickly! Quickly, therefore; and again I say to you, quickly, all of you, both rich and poor; come, I say, whoever of you are alarmed by fear of the close-approaching pestilence[1]. Be not afraid, and be not anxious; nor let your heart be struck with terror, but rather let it be comforted, since (as we read in Holy Writ) God does not make death, nor rejoice in the destruction of the living, but has created man immortal in the image of his own likeness; and has made all the nations of the earth to be curable; for the All-Highest himself created from the earth, for the health of peoples, medicine, from which the prudent man will never shrink back. For (as all the wise assert) God and nature neither abound with the superfluous, nor yet fail with what is needed.

One who is already infected takes (as quickly as possible) of this miraculous and sublime poor man's medicine 1½ drams with 3 ounces of holy water[2]; then, if it seems suitable, after eight hours he will take a second and a third dose of the medicine itself, and as with the first, eagerly and quickly; so that within twenty-four hours he will have diligently taken three potions of this medicine, if it shall have proved necessary.

Having done this, let the sick man hold fast to this thought, whoever he may be: that, when this lash from God is removed, he will escape wholly, and be completely free from, every other fatal and savage pestilence. But let him be advised especially by no means to venture to sleep or to eat during the twenty-four hours in which the cure is being accomplished; moreover, that, if sufficient of the disease's matter is evacuated after the first or second drink of the medicine (through the innate, dominating power that rules it), by means of defecation, sweating, or vomiting, then the sick man should refrain from another potion of this medicine and turn to reinvigorating and restoring himself by means of the best food at his disposal.

But if any mark has appeared on any member of the sick man's body, the abscesses should be immediately poulticed with scabious or with *consolida minor* (the daisy?) well ground between two living stones, since these herbs, indeed, thus (by a certain supermiraculous property of their own) will very quickly mortify and destroy an anthrax or carbuncle[3].

The same is said to be true of hound's tongue, when similarly ground up and poulticed on. And also of devil's bit.

Likewise, water-betony, i. e., the herb borith, or leaves of the soapwort, if crushed together with their blossoms and laid on, immediately (as is said by those worthy of

[1] Cf. note 8, below, passage quoted from Marsilius Ficinus.

[2] *Aqua benedicta*, and other waters with names of theological or mystical application, occur frequently in the mediaeval formularies, but I have not hitherto found *aqua sancta* (according to Du Cange, composed of plain water and salt) prescribed medically.

[3] Cf.: *Item consolida minor trita inter duos lapides: & antraci superposita divino miraculo antracem cito destruit & mortificat.* (Arnoldus de Villanova, *Breviarium practicae medicinae*, Venice, Tortis, 1494, *lib.* 3, *cap.* 22 (*De antrace seu carbunculo*).)

ipsa resoluit. vel eā rumpit. purgatq; vt decet. z potenter curat.

¶ Item Galbanum (vt dicitur) si super petiam lineā extensum. Antraci superponatur. (si curabile est) eidem statim taliter adheret: q; inde quidē de facili remoueri non potest: donec radicē eius ex toto extirpet. trahatq; secū. Si autem Antrax curabile non est: tunc non adheret ei: qō valde quidem notandum est. Hoc idem de Cedria liquida. z merito dicitur.

Note 4

¶ Itē si Smaragdū optimi vitrois. Antraci vel Carcūculo. qs circūdet: Deindeq; supra eum. de directo. aliquantulum teneat illud: ipse profecto lapis. non aliter. id extinguit. q̄ aqua ignem extinguat. Idem de lapide granato. z idem de Topatio Aureo. nobis a sapientibus intimatur.

¶ Pro mundificando autem z desiccando a se homo. omnem pestiferam corruptionem: z pro custodiendo. se ab omni epidimiali infectione. experimentum certissimum est hoc. vz. Si die qualibet. dragmam vnam sumat de pillulis aloeticis. Que quidem in hoc casu. adeo. salubriter competūt. q; a. doctoribus medicine: pilule cōes. z pilule de vita. nuncupantur. z ab eisdem. tantū earū ad hoc. preconizantur laudes: q; vbiq; ab aromatarijs semper preparate inueniuntur.

¶ Item Grecorum experimentum: qō omnes etiam medici nostri. ad preseruandum a peste (absq; vlla discrepantia) cōprobant. est: vt homo omni mane. duas ficus Albas z siccas: nucemq; vnam: z. xxx. folia rute viridis: cum vno grano salis: contritis z inuicem cōmixtis. comedat: z post statim: vncias duas boni vini albi. bibendo transgluciat: Et quidem (vt aiunt) assiduatio. huius eficacissimi electuarij. ab oī pestifera infectione. mortiferoq; veneno: ac ab omni etiā sagarum maleficijs sumentem. mirumimodum defendit. conseruat. custodit.

¶ Item pro preseruando se homo quicūq; tempore necessitatis ab omni corruptione atq; contagione pestifera: Accipiat omni die per os quātum est faba vna: de Tyriaca Andromaci antiqua. vel de optimo mitridato. cū aqua acetosselle. vel capitis monaci. vel endiuie. bene distemperatis: z hoc in mane quando surgit a lecto: z post per. iiij. horas ad minus: differat a comestione: est vtiq; experimentum hoc fidele magnum z singulare.

¶ Item potio Bezoardica. preseruans vtentē ab oī peste: z ab oī veneno.

¶ Recipe syrupi de citro sublimi. ℥. i. aque acetosselle. ℥. iiij. misceantur z bibant de mane antequā de Camera sumēs egrediat. Est vtiq; potio hec virtutibus humani corporis oībus familiaris: naturali. i. vitali. z a alis cōes ipsas confortans. sed proprie vitalem virtutem que est in corde.

belief) either dissolves the abscesses or bursts them open, and purges in a fitting manner and effectually cures.

Likewise, galbanum (so they say), if spread on a piece of linen and applied to the anthrax. If the anthrax is curable, the cloth will stick so fast to it that it cannot easily be removed until it extirpates the root entirely and draws it off along with it. But if the anthrax is not curable, then the cloth will not adhere[4]—which must be very carefully noted. The same is said of cedar-pitch, and deservedly.

Likewise, should anyone be putting smaragd of the brightest green around an anthrax or carbuncle, then let him hold a little of it directly above the abscess. The stone actually extinguishes it not otherwise than water extinguishes fire. The philosophers intimate to us that the garnet and the yellow topaz have the same power.

But for cleansing himself and drying up all pestiferous corruption, as well as for guarding himself against epidemial infections of all kinds, a most certain experiment is this, namely, if a man take any day 1 dram of aloetic pills. Indeed, these pills are so agreeably to the purpose that they are called by the doctors of medicine "common pills" and "life pills", and they proclaim their praise of these pills for this purpose so loudly that the dealers in aromatics all keep them constantly in stock.

Likewise, an experiment of the Greeks, approved even by all of our physicians (without any disagreement), for the plague: it is that, every morning, one eat two white, dry figs, one nut, and thirty leaves of green rue, with a grain of salt, ground and stirred in turn; and immediately after, that he wash it down by drinking 2 ounces of a good white wine. Indeed, constant use of this most effective electuary (so they say) in a marvelous manner defends, preserves, and protects him who uses it from every pestiferous infection and deadly poison, and even from the evil powers of the female soothsayers.

Likewise, for preserving himself from every corruption and pestiferous contagion in time of necessity, let any one at all take by mouth a bean's size amount of the ancient theriac of Andromachus or of the best mithridate well diluted with the juice of wild sorrel, monk's hood, or endive. This should be taken in the morning on arising, and no food should be eaten for at least four hours: an experiment, this, that is greatly and singularly trustworthy.

Likewise, a bezoardic potion, guarding the user against all plagues and poisons:

Take of syrup of citrus sublimate 1 ounce, of juice of wild sorrel 4 ounces; let them be mixed and imbibed in the morning before the user leaves his chamber. This potion is undoubtedly a familiar to all the powers of the human body, namely, natural, vital, and animal, strengthening them all, but especially the vital power which is in the heart.

[4] Cf.: *Idem facit galbanum supra peciam lini extensum & suppositum antraci: si enim est curabilis adheret statim ei. & non potest inde remoueri: donec radicem antracis attrahat. Et si non fuerit curabilis tunc non adheret ei.* (Arnoldus de Villanova, *loc. cit.*)

¶ Item potio alia. pro preseruando se omnis se preseruare volēs apestē vtilis multum ⁊ efficax plus quam credi possit.

¶ Recipe boli Armeni ℥.ij. vini albi ⁊ odoriferi. ℥.ij. aque acetoselle vel rosarum ℥.iiij. misceantur atq; bibantur. Hoc idem ⁊ proprijssime dicitur de luto diuino.

¶ Item pro preseruando se (tam diues q̃ pauper) ab oi aeris aquarũq; ⁊ aliorum hominum corruptione: ac ab omni venenifera ⁊ perniciosissima potione: experimentum notabile: atq; securum est: ꝙ si homo quinq; vel septem grana seminis Citri magni. ⁊ proprie dulcis. de mane sumat: ipsa quidem grana sui bezoardica. excellenti. atq; eximia proprietate: ad hoc manifesti atq; sublimis sunt iuuamenti.

Note 5 ¶ Item ad hoc idem faciunt tria grana ligni vite mortuorum minoris. i. tria grana maioris iuniperi. vel tria grana lauri siluestris.

¶ Item experimenta quedã valde notanda: que ego sane pro principibus. prelatis. diuitibusq; necnon pro ciuibus simul ⁊ popularibus (hac insigni preconizatione mea palam decerno. vt ꝙ quicũq;) yaspides christalinum viridemq; ⁊ sanguineis. seu Rubeis quibusdam guttis aspersum: in ore (ipsum sugendo) portauerit. illo tunc ab vlla profecto aque vel aeris corruptione: fetoreq; cadauerum ⁊ hominum contagione: necnon serpentum atq; draconum alitu vel morsu: nequaq̃ corrumpi nec infici potest.

¶ Hoc idẽ dicitur de Jacinto. atq; Carbunculo granato: de Saphyro: de lapideq; Smaragdi. ⁊ de Thopatio Aureo: necnõ de lapide Ametisto: ac non minus de lapide Ematbite. Sunt enim ista de magnis sapientum. philosophorum secretis.

Note 6 ¶ Item experimentum: pre omnibus a nobis iam in superioribus preconizatis. ⁊ in hoc exaratis atq; digestis papiro. amenius. delectabilius ⁊ a paucissimis cognitum est. vt recipiatur de Cinamomo preelecto. i. de specie illa magis preciosa q̃ similis est cassie lignee massollatice. Nigrum. s. habente colorem: ad igneitatem ⁊ rubedinem declinante: ⁊ quod est Lene. recens. acerq; gustui ⁊ lingue mordax in similitudinem seminis nasturtij cum dulcedine quadam: habetq; odorem cum multa aromaticitate acutũ. sicut est odor Cardamomi: ⁊ ꝙ cum frangitur frustrum eius: visibile spiramentum emittit: ad ymaginem nebule. seu pulueris odoriferi. cuius

Note 7 quidem odor. omnia que in eius sunt circuitu superat ⁊ excellit. Huius autem Cinamomi virtus. (vt volunt duces ⁊ principes medicorꝝ) calida est in tertio ⁊ sicca in secundo. Sed nõ est vlla alia medicina calida. cuius

[5] *Lignum vitae mortuorum minoris* (wood of the inferior life of the dead?) I have not come across elsewhere. But J. J. Manlius de Boscho, discussing the relationship between the *cedrus* and *juniperus* (*Luminare maius*, Pavia, Carcano, 1494, f. 23b, col. 2), repeats Dioscorides' description of the *cedrus*, relates it to the *serbin* of Avicenna, and tells us that the latter author "ranks it among the species of pine tree whose wood is called 'wood of the dead' (*lignum mortuorum*) because it preserves dead bodies from putrefaction. . . ." Serapion, another Arabian physician, says (*Liber aggregatus in medicinis simplicibus*, Venice, Novimagio, 1479, f. 108a (sig. O1a)) that some call it the "life of the dead" (*vita mortuorum*). Dioscorides (*De materia*

Likewise, another potion for all those wishing to preserve themselves safe from the plague. This one is highly useful and incredibly effective:

Take of bole-Armeniac 2 scruples; of white, fragrant wine, 2 ounces; of juice of wild sorrel, or rose water, 4 ounces; let them be mixed and imbibed. The same is said, and very properly, of divine lute.

Likewise, a notable and safe experiment for preserving oneself (whether rich or poor) from all corruptions of air, water, and other men, as well as from poisonous and dangerous potions of every sort, is this: if one take 5 or 7 grains of the seed of the large citron-tree, especially the sweet, in the morning. These seeds, through their bezoardic, excellent, and extraordinary virtue, are of obvious and eminent assistance for this purpose.

Likewise, they prepare for this purpose 3 grains of wood of the inferior life of the dead[5], that is, 3 grains of juniper major, or 3 grains of wood-laurel.

Likewise, certain experiments to be noted carefully: which I, on behalf of princes, prelates, and the rich, but no less for the citizens and the populace at large, decree openly in this extraordinary proclamation of mine: namely, that whoever shall have carried in his mouth, sucking on it, jasper, crystalline and green and stained with certain bloody or ruby drops, can in no way be corrupted or infected by any corruption of the water or air, by the foulness of corpses and the contagiousness of the living, by the *alitu* (?) or bite of serpents and snakes.

The ame is related of the jacinth and the grained carbuncle, of the sapphire andf the yelsow topaz, of the amethyst and the hematite; for these are from the secrets o the lealrned philosophers.

Likewise, an experiment pleasant and delectable above all others unearthed and set forth by us in previous proclamations[6] and in this scroll, and one known to few, is that preferred cinnamon be taken, i. e., the more valuable kind that is like the cassia lignea from Massola. It is dark in color, inclining towards a fiery ruddiness, smooth, fresh, and pungent in taste, biting the tongue in the same manner as the nasturtium seed does, with a certain sweetness. Its odor is sharply aromatic, like that of cardomom. And when a bit of it is broken off, it sends up a visible breath like a cloud or an odoriferous powder, the odor of which triumphs and excels over everything around it[7]. Of this cinnamon, moreover, the quality (as the leaders and chiefs of the physicians have it) is warm in the third, dry in the second, degree. But there is no other warm medicine whose dryness can match it on account of the great subtlety of its substance. For it is the ultimate in subtlety, attractive, aperient, and softening;

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*medica*, Colle, Medemblick, 1478, under *cedrus*) also says that it is called "life of the dead." As both Dioscorides and Mercurius link it with the *juniperus*, it seems probable that Mercurius found, or invented, this still more fanciful descriptive name for a species of the *cedrus* or *serbin*. In the days before guaiac and its *alter ego*, *lignum sanctum*, were discovered, *lignum juniperi* was used successfully in the early stages of the lues venerea, according to Astruc, *De morbis venereis*, Paris, Cavelier, 1736, p. 109 (*lib.* 2, *cap.* 6).

[6] No other publication of this sort by Mercurius is known.

[7] Cf.: *sed melior est omnibus qui similis est cassie masilitis. qui recens fuerit: et niger colore: et qui missus in vino soluat se. virgulas habet teneras et lenes nodis plenas cum odore pleno veluti rute. acer et mordax gustu in similitudine nastutii semis cum quadam salsitate et feruore et parua viscitudine. cuius astas cum fregeris: puluerem emittunt odore omnia vincentes. . . . Tercium genus est simile cassie masseleotice.* (Dioscorides, *op. cit.*, under *cinamomum*.)

deficcatio tanta sit. sicut est deficcatio istius. propter magnam sue substã-
tie subtilitatem. Est.n. vltimum in subtiliatione. atratiuumq3. z aperitiuũ
ac lenificatiuũ: aperit itaq3 meatus stomachi aromatizans illũ. z humores
qui in eo ad putredinem apti sunt: subtiliat. corrodit. resecat. resoluit. de-
siccat. expellit. mundificatq3 ipsum. atq3 corroborat (omnem illius putre-
factionẽ. odore suo retificãs z adaptans) Cõuenit itaq3 hec preciosissima
medicina egritudinibus quibuscũq3 ex corruptis humoribus generatis:
z vniuersis fetidis z putridis ycoribus obsistit: ac sic non parũ vniuersis
malis humani corporis dispositionibus comodum prestat. Sed multum
quippe est vtile virtuti corrupte. reparans eam in bonũ. ex sui nãq3 aro-
maticitatis virtute: Cerebrum. Cor. stomachum. z epar confortat: z valet
contra syncopim z cardiacã. Veneno potato insuper. z venenatis reptiliũ
ac vermium venenosorũ morsibus occurrit. atq3 sic valde z plusq3 valde
humanum corpus ab omni corruptione putrefactioneq3 ac infectione pe-
stifera protegit. preseruat. atq3 custodit illesũ. vt. si a mane vsq3 ad solis
occasum. vicisim ac pluries aliquantulum de eo quis stando z incedendo
in ore suo ponat. masticetq3 z ipsum sugendo deglutiat.

¶ Ad hoc idem z eodem modo contra pestilentiam (vt iamdiu experi-
mento veritatis comprobatum est) sed cum amaritudine multa z ingrato
sapore: celeberrime faciunt. Hyptamus. Yrcos. zeduaria. Radix berbe
tunicis. Cẽtaurea minor. Gentiana. Ruta. Radix ebuli. ac Radix caparor
¶ Multa multa nãq3 grandia: saluberrimaq3 z efficacissima valde sunt
experimenta atq3 remedia: Que ego (ad preseruãdum a peste: cũ magnis
laboribus bincinde: ex potioribus medicorũ capitulis. ac ex aromatariorũ
atq3 terrestris paradisi huius affluentissima amenitate) ex florani. precle-
gi: z (in vnum congesta) in iam prelibatis palam ad liquidum mea preco-
nizanti voce explicaui: Sed quorũcũq3 expertorum inuamentorũ in tali
z tanto discrimine vincens presidium. est illud quippe trium orientalium
ac sapientum magorum: diuinum z preciosum humane vite munus.
qd olim. i). (stella duce) Ad auctorẽ vite Cristũ peruenientes: z thesauros
suos aperientes. ac adorantes eum. ipsi puero venerabiliter obtulerunt.
Accipite ergo tria eorũdem vitalia munera. vt. Mirrhe electe. partẽ vnã.
Note 8 Thuris masculi. partes duas. Auri. s. ipsorum. partes tres. Contundite
hec simul. z cum modico fecis aceti fortissimi in vnũ diligenter conficite: z
super corium. vel super petiam lini spissam z nouam. subtiliter extendite.
illãq3 (. s. triangulatam z in forma scuti dispositam) super stomachũ vestrũ.

and so it opens the passages of the stomach, aromatizing it and the humors in it that are susceptible to putridity. It refines, gnaws away, cuts, dissolves, dries up, expels, cleanses, and strengthens the stomach (by rectifying and adjusting its putridity by means of its odor). And so, it is agreed, this very valuable medicine is inimical to whatever ills are generated by corrupt humors and to all fetid and putrid humors; as well as being no little suitable for all the injurious dispositions of the human body. But it is very useful, indeed, to a corrupted activity, restoring it to good health; for, by its aromatic virtue, it strengthens the brain, the heart, the stomach, and liver, and prevails against syncope (?) and heart-burn (?). It counteracts a poisoned drink especially, and the poisonous bites of poisonous reptiles and insects; and, so, powerfully it protects, preserves, and guards the human body from every corruption, putridity, and pestiferous infection; namely, if from morn to sunset, many times, while standing still and on the move, one puts a little of it in his mouth, masticates it, and swallows it down.

Famously useful, also, and in the same manner, against the plague (and the truth of this has long been proved by experience), though they are very bitter and unpleasant to the taste, are dittany, iris, zedoary, root of the herb tunic, centaury minor, gentian, rue, dane-wort, and capparid-root.

Many, many, indeed, are the great and salutary and entirely effective experiments and remedies. These (for preservation from the plague, and with great labor) I have culled and selected from the better chapters of the physicians and from the affluent amenity of the dealers in aromatics and of this terrestrial paradise; and having made a compilation of them, with these heraldic words I have spread them forth openly to view in the above. But of all proved aids, a protection of surpassing difference is that of the three wise magi of the East: a divine and precious gift to human life, which, once upon a time, coming under the guidance of a star to Christ the Author of life and revealing to Him their treasures and adoring Him, they offered reverently to the Child Himself. Take, therefore, the three life-giving gifts of these wise men: vz, of select myrrh, one part; of male frankincense, two parts; of gold (that is, of their gold), three parts[8]. Grind these together and compound them carefully with a modicum of the lees of very strong sour wine; then spread lightly on a piece of leather or a piece of thick, fresh linen. Place this (cut in triangular shape and arranged in the form of

[8] Cf.: *Magi stellarum obseruatores ad Christum uitae ducem stella duce uenerunt / pretiosum uitae thesaurum offerentes / Aurum / Thus / & Myrrham. . . . Huc igitur omnes ad sapientes magos uenire senes munera uobis quoque uitam productura ferentes. Quibus auctorem uitae quondam uenerati traduntur. Venite senes inquam senectutem grauiter tolerantes. Venite / & uos praeterea / quoscunque senectutis propemodum aduentantis formido sollicitat. Accipite precor alacres uitalia dona. Summite uncias quidem thuris duas: unam uero myrrhae: auri rursum in folia ducti dimidiam drachmae partem. . . . Hoc tres in uobis spiritus naturalem / uitalem / animalem / fouebit / confirmabit / corroborabit.* (Marsilius Ficinus, *De triplicivita*, Florence, Miscomini, 1489, lib. 2 (*De vita longa*), cap. xix (misnumbered xviii; *Magorum medicina prosenibus.*)) Referred to by Lynn Thorndike, "A history of magic and experimental science," IV, 565 (Columbia univ. pr., 1934).

puerorũq;·z filiorꝫ vestrorꝫ insuper tanq̃ cerotbum ponite. ferteq; sic eãs (cũ pestilẽtie furor vos trepidãti pauore excrutiat). Eteniz bec medicina vite vera. Hic bũane nature fidissimus clypeus. Hoc defensoriũ cordis illud a quocũq; contrario inuicte defendens: Quoniam bec medicina ad boc creata est·sacrosanctaq; z a dño Jbesu puero benedicta: Jn tantũ q̃ si illã sic sup se portans ambulauerit in medio vmbre mortis:nõ occidet z non nocebit ei:illius borrenda atq; seuissima pestilẽtie falx: Vnde z boc empericiz: Gaspar fert Mirrbam. Tbus Baltbasar. Melcbior Aurum. Hec tria qui secum portauerit munera regum. Soluitur a Morbo xpi pietate nõnullo. Sed super boc summopere animaduertendũ est. q̃ aurũ magorum.non est aurum vulgi nec monetarum. Sed est aurum purum z mundum.tanq̃ vitrum perlucidum. qõ bucusq; a comuni theologizantiũ synodo penitus ignoratur.

Quinimũ tamen in boc trepidando atq; borribili casu.supermirabileq;. ac stupendum nimis. Jpse profecto est lapis miraculorꝫ. Lapis.s.sapiẽtũ occultus.ac lapis ipse etbereus atq; repertus vbiq;: Qui tres omnes in se mundi babet naturas. inferiorũq; z superiorũ virtutem.ac sic virtutes de iiq; integrã.ad perpetranda totius eiusdem triplicis nature miracula. estq; sic totius fortitudinis fortitudo fortior. prodegiorũq; pater.ac gloria claritatis totius mundi. Jdeo a nostra siquidẽ medicina(cuius optimam nempe dispensationem.in boc nostro preconizanti opusculo non descripsimus) fugit omnis obscuritas mortis. omnisq; inopia vite.ac oĩs pestilentie excessiua infectio: Quoniam eiuscemodi medicine. Jpse miraculorum Lapis.prima eius est radix.ac eius essentialis substantie principale fundamentum:cuius quidem virtus superior(tanquã fulgur. e celo de sub nube ventorum impetu circũpressa)exiliẽs: necnõ sic vincens oẽm rem subtilem congelando.z omne solidum penetrans resoluendo: omnes pestiphere mortis infectionẽ cõfligit.dissipat.z absorbit. Vnde Medicina ipsa. propter hunc miraculorum lapidem: Medicina miraculosa a nobis merito nuncupatur. Est autem sic in ea spũs fortis z potens:quem omnes querũt sapiẽtes:spiritusq; ardoris:z spiritus iudicii: Quo nempe sic ipsa medicina nostra: Antidotum. z Elysir ac purgamentum est omnium humanorum corporum.purgandorum.curandorumq;. et transmutandorum.de complexione mala ad bonam.z de infirmitate ad sanitatem.z de senectute ad iuuenescentiam.z de extremis singulibus mortis ad vitam. Nihil. nihil est dicit ignarus.auarusq;. z inuidus. ac sibimet impius

Note 9

a shield) on your stomach and on the stomachs of your servants and children, moreover, as though it were a wax poultice; and wear it thus (when the fury of the pestilence tortures you with agitating fear). For this is the true medicine of life, this the trustiest shield of human kind. Whereas a shield is protection for the heart alone, this will defend you invincibly against every adverse force: since this medicine was created with this in mind, being, furthermore, sacrosanct and blessed by the Child Lord Jesus—so far that if one wears it and walks in the midst of the shadow of death, still the dread and cruel scythe of that pestilence will not slay or harm him. And the origin of this empiric: Gaspar proffers myrrh; Balthasar, frankincense; Melchior, gold. Whoever carries with him these three gifts of the kings is released from all disease through the love of Christ. But this must be especially noted: that the gold of the magi is not ordinary gold, nor that of monies, but a gold pure and fine like pellucid glass, and entirely unknown thus far to the common synod of theologizers.

Finally, still, in this fearful and dread situation, supermiraculous and wonderful beyond measure is the stone of miracles itself; namely, the occult stone of the philosophers, ethereal and found everywhere, which holds all three orders of the world within itself, both the power of the lower things and that of the upper, and, thus, finally, all power to perform the miracles of all this triple order. Its strength is thus stronger than all strength[9]. It is the father of prodigies and glory of the splendor of the entire world. Hence, through our medicine (the best dispensation of which I have not, to be sure, described in this proclamatory little work), the whole obscurity of death, all of life's wants, all the immoderate pestilential infections, are put to flight, since the stone of miracles itself is its prime root and the principal foundation of its essential substance. The superior power of the stone, darting forth (like lightning from the sky from under a cloud assailed on all sides by violent winds) and overcoming all subtle things by induration, penetrating all solid things by resolution, combats, dissipates, and absorbs all the plague-born mortal infections. Hence, the medicine itself, on account of this stone of miracles, we deservedly call the miraculous medicine. It has, moreover, a strong and powerful spirit which all the wise seek, a spirit of fire and a spirit of judgement, so that, in truth, this medicine of ours is an antidote, an elixir, and a purge for all human bodies requiring to be purged, cured, and transmuted from bad physical habit to good, from illness to health, from old age to youth, and from every border of death to life. The ignorant, the avaricious, the envious man says: "It's worthless; there's nothing to it"—thus being undutiful and cruel to

[9] Cf.: *Sic habebis gloriam totius mundi. Ideo fugiet a te omnis obscuritas. Hic est totius fortitudinis fortitudo fortis, quia uincet omnem rem subtilem. omnemque solidam penetrabit.* (*Tabula smaragdina Hermetis*, in *Alchemiae Gebri Arabis . . . libri*, Berne, Petreius, 1545, p. 294.)

atq; crudelis. Pestilentia vero flagellatus insipiens sapientior fiet. Viri aũt prudẽtes & pientissimi. pedibus & manibus. nostrã quidẽ miraculosaq; incõparabilẽ & apud nos penitus. in bis oĩbus reseruatã accersient medicinã: & (tamẽ Jocale preciosum. atq; peculiare) eam apud se. oĩ cũ diligẽtia. thesaurizabunt. Medicinã dico. q̃ ab oĩ pestiferi virus cõtagione (nedum vt ille de quibus. ad hoc. in presenti hac nostra preconizatione. expressam fecimus mentionẽ) sanq; preseruat atq; custodit: verum etiã illa (excessu diuine caritatis ad hoc sũmo. Eternitatisq; mysterio. ac totius sacrosãcte & Indiuidue Trinitatis opere. & sacramento) Infectum cẽm. a quacũq; eius seuissime pestis infectione (quasi per miraculum) suauissime curat. sanatq;. & liberat: Sumẽt igitur ipsaq; prudẽtes tẽpore necessitatis. & inter mortuos. a morte resurgent: viuentq; corda eorũ. & ita eidem (a quo oĩs est medela. medicusq; & medicina creatur. ac qui solus percutit & sanat. vulnerat & medetur. Reducit vsq; ad portas mortis. & reducit. estq; mors mortis. & ruina inferni. necnon resurrectio & vita. filius sũmi Dei. & filius semper virginis. Deus oĩs noster Jhesus Christus: ex totis precordijs suis. ac cũ cum gaudio atq; letitia) gratiarũ actionem. benorẽq;. & laudes. ac oẽm benedictionem referent. qui tam benedictam. tam salutarem. & tam preciosissimam Medicinam. illis pro tam modico ere (per seruum suũ) participare dignatus est. Ab ipso etenim oĩum creatore. Judiceq;. & Triumphatore eterno. Hec oĩa facta sunt: et ne Truphantulorum. seu circulatorũ nugacitate: populus & pauperes eius. in hac vrbe. decipiantur: hoc vtiq; (.s. distribuendi dispensandiq; eiusdem oĩi Dei donum) nobis tantũmodo concessum est priuilegiũ. Qui incredulus est. in fideliter ageret. et qui depopulator & fratricida ẽ. dolose & fraudolẽter pfestim procedet. Maledictio nempe. & Anathema psius horrendi ac pertremendi iudicis (vt etiam in principio scriptum est) iemiam attrocissime. & vlla absq; misericordia. vorabit eum. Ita & ipsi excelso. atq; omnipotenti. Christianorũ ac totius mundi Deo: omnium creaturarũ spiritu. virtus. gloriaq;. & benedictio omnis. Amen.

FINIS.

himself. But after being flagellated by the plague, the fool will become wiser. The cautious and pious, on the other hand, will seek hand and foot to obtain this miraculous and incomparable medicine of ours, deeply hidden in all this, and will treasure it among them with as much care as if it were a precious and extraordinary relic. I speak of the medicine which preserves and guards a healthy man from all contagions of the plague-bearing virus (not only those of which I have so far made mention in this present proclamation); but which also, (by the widest projection of the divine charity hitherto, by the mystery of eternity, and by the work and sacrament of the united and individual sacrosanct trinity), most agreeably cures, and heals, and liberates (as if by a miracle) all those already infected by any infection of this cruel plague. The prudent will, therefore, use it in time of necessity and they will arise from death among the dead and their hearts shall live. And so, indeed, with all their hearts and with joy and gladness, they will render thanks and honor and praise and all benediction to Him, the Creator of all healing, physicians, and physic, who alone smites and heals, wounds and makes sound, who leads us to the very portals of death and bringeth us back, who is death to death and destruction to the infernal regions, who is the resurrection and the life, Son of the All-Highest God, and forever son of the Virgin, our Lord God Jesus Christ, who has deemed them worthy to share at so little cost (through his servant) a medicine so blessed, so salutary, and so precious.

By the Creator of all things, the Judge, by Him who is eternally triumphant, are these things brought to pass; and let not his poverty-stricken people in this city be deceived by the idle claims of the quacks and the mountebanks. This privilege (of distributing and dispensing the gift of the same Lord God) has, without question, been granted to us alone. Whoever is incredulous will act unscrupulously, and he who is a robber and a fratricide will straightway show himself crafty and deceitful. The curse and anathema of the dread and fearful Judge himself (even as we said in the beginning) will consume him most horribly and pitilessly. And so to the exalted and omnipotent God of Christians and the whole world, the spirit of all created things, all power and glory and benediction. Amen.

FINIS

(*End of Part I*)

# Memoir of Robert Grant Torrey, M.D.*

*By* TRUMAN G. SCHNABEL, M.D.

IN THESE parlous days when the eyes of the world are focused on the mass reaction of people to war, leaving in its wake suffering, starvation and death, one is prone to think of the influence which environment and circumstances have had in shaping the character and destiny of these people. A man, as a part of the society in which he moves, is likewise molded and chiseled by the place of his habitation with a multitude of stimuli; but for him, it can be said in addition, that heredity plays a most important role in making him the manner of person he happens to be. Robert Grant Torrey, Fellow of this College for more than 28 years, reflected his English lineage in extraordinary degree. He was of more than average physique, possessed of a distinguished manner, undemonstrative and exhibited firm but fair convictions.

The first of his American Torrey forebears came from England in 1640 and settled in Weymouth, Mass. The Mayflower brought a paternal ancestress, Fuller by name, to Plymouth in 1620. His mother was Harriett Pratt and a maternal ancestress was Adeline Barnes. Both the Barnes' and the Pratts settled in Connecticut in the first half of the 17th Century. A distant ancestor, Lieutenant Samuel Torrey, died at Louisburg, Cape Breton, some time after he had engaged as a colonial soldier in a campaign which wrested this site from the French in 1745. A great grandfather, Jason Torrey, was one of the first students to attend Williamstown Academy when it opened its doors in 1791. This institution was later incorporated as Williams College in 1793. The same Jason Torrey, as a surveyor and pioneer, opened up the northeastern part of Pennsylvania at the beginning of the 19th Century and was a local agent in that section of the state for Robert Morris and other Philadelphia bankers. He was particularly instrumental in developing what is now Wayne County and in founding Honesdale, Pa., where Bob Torrey's father was born. Surely these ancestors, having played a part in the early development of this country, both in peace and war, must have transmitted to their progeny many of the attributes which we admired in our former colleague.

The subject of this memoir was not born in rugged New England, nor in our own Pennsylvania, but in Henrico County, Virginia, on July 12th, 1878. Here it was that his father was at the time, general manager of a coal mine, located about 15 miles from Richmond, in an isolated coal field, which had been worked from time to time, for at least 100 years. The Torrey family moved to Montclair, N. J., when Bob was a small child, where he grew up and obtained his secondary school education. It was during these early years that he manifested a keen interest in nature and learned of her wondrous ways. Later on in life he surprised his friends with his intimate knowledge of flowers, birds and trees. Then too, did he devote some time to painting and acquired some appreciation of music, which enabled him to compose

* Read at the meeting of the College, May 7, 1941.

for his college fraternity, "A Song for Old Psi U." His academic achievement in High School was noteworthy to say nothing of his successful performance on the school foot ball team.

He engaged in the woolen business for 7 years after graduation from High School. Some of these years were spent in New York and some in Chicago. He joined Company K of the 2nd New Jersey Volunteers during this period of his life. He developed typhoid fever while his regiment was encamped at Jacksonville, Florida, was invalided home and by the time he had completely convalesced, the Spanish American war had come to an end.

There had been no medical tradition in the Torrey family. Bob Torrey's middle name, Grant, was however, given for a Doctor James A. S. Grant, an uncle by marriage and a British doctor who practiced medicine in Cairo. This Doctor Grant was the personal physician to the Khediv who ruled Egypt in 1870 and for years thereafter.

Torrey himself, decided to study medicine sometime during his days in the woolen business or perhaps, earlier in life. He accordingly entered the University of Pennsylvania in the fall of 1902. He continued in medical school, as he was in high school, an exceptional student. He was so, in spite of much time devoted to foot ball. He is reputed to have been an able and inspiring captain of two highly successful Pennsylvania teams. It is enough to note here that his brilliant achievements on the gridiron are a matter of record in foot ball history and that he played the original role in the development of the "roving center" technique, well known to all students of the game, both casual and serious. He made up for time given to athletics by burning the midnight oil. Fellow students report that they found him, night after night, deeply immersed in study when they might be returning from a round of pleasure down town. He was in the habit of brewing tea over an alcohol lamp during these early morning hours. He carried his equipment for making tea wherever he went. He took very careful notes in the classroom and his note books were admired for their completeness, neatness and well executed illustrations. While in New York, he had attended night classes for several years in the Art Students' League. It is said of him that he owned but one text book at the end of his medical school days—that one being a medical dictionary. His classmates comment on his seriousness, conscientiousness and amazingly retentive and accurate memory. He depended largely on this memory and his notes. Thus it was that he graduated among the first ten ranking students of the class of 1906 and subsequently became an Intern and Chief Resident of the Hospital of the University of Pennsylvania.

Here he continued all absorbed in medicine, inspiring confidence in his patients, always kind and gentle, in spite of his physical self which had only recently vaulted him to "All American" distinction on the foot ball field. Medicine was now his sole interest—foot ball was a thing of the past. He was unaffected by hero worship. He made the metropolitan press on one occasion as an intern, when he successfully operated on a patient who had had a stab wound of the heart. The patient lived satisfactorily for a number of days after operation, but it is recorded that the patient died in spite of prompt and efficient surgical therapy.

Torrey's contributions to medical literature were not numerous as measured by the out put of some of our medical

confrères. His biographical and bibliographical data are detailed as an addendum to this memoir. His first published article reports the successful use of an intravenous infusion of twelve pints of normal saline solution for hemorrhage, in a patient who had suffered an incised wound of the abdomen. This paper is particularly interesting in the light of the history of transfusion, as we know it to have been made, since 1909. His last paper, as it proved to be, was somewhat in the nature of an epitomized experience. He presented it at the recent November meeting of the Section on General Medicine of this College and it concerned itself with influenzal pneumonia, with especial reference to an alteration of characteristics as determined by various complicating infections. His interest in influenza dated back at least to his experience with this disease, as he found it in his capacity as a Major in the Medical Corps, at Camp Hancock during the epidemic, in the first World War. He had made some interesting observations particularly from the physical examination standpoint and had continued as a keen observer of the disease during the intervening years. Of his medical writings it can be said that they covered a good many topics in Internal Medicine as might be expected of one who did not concentrate on an especial division in the larger field. They presented in the main, very interesting view points, and exhibited no tendency towards plagiaristic recapitulation and least of all, were they grist to his mill. Most of his papers were of a clinical order, except one in which experimentation was undertaken to determine the nature of the toxicity in experimental acute pancreatitis.

His longest tenure of service was given in the cause of tuberculosis; first for the state and then for the city. Thirty-three years of devotion to battle against the erst-while white plague, almost duplicates in time the organized efforts which have been made in the interests of the prevention of this disease. A long association with the Philadelphia General Hospital as Physician, Secretary of its Medical Board and finally as its President, afforded him ample opportunity to exert a beneficent leavening of this great institution. Here it was that he taught medical students for more than 25 years. For the last 10 of these years, he did so as the Professor of the Principles and Practice of Medicine at the Woman's Medical College. He bestowed his helpful pedagogic efforts generously on students, interns and his consulting colleagues alike. He was not a dramatic or sensational teacher, but nevertheless, was impressive because of a certain earnestness in presentation and by the exhibition of a complete understanding of his subject. As a result, students will long remember the wisdom of his teaching. Significantly enough, he was stricken while teaching at the Philadelphia General Hospital. He died, after a short illness, on January 11th, 1941. He had served to the last, as he must have preferred it, in the cause and interest of Medicine.

He married Florence Peace Smith in 1915, who survives him together with two sons: Robert D. and Phillip C. He seemed happiest when he was able to join his family in work or play. A portrait of "Bobby" done in the impressionistic manner, well illustrates his father's artistic talent.

There is general agreement that he loved his profession and patients above all else. In turn, his patients were loyal and devoted to him, good evidence that he was a real doctor. He spent some of his leisure moments in reading history

with which he was familiar in an amazingly accurate degree. Vacation time was often devoted to fishing. He had a quiet, fine sense of humor, well mixed with his more serious moods.

Robert Grant Torrey remained throughout his life, quiet, observing, making up his mind in a logical fashion and sticking to his viewpoint. He was aesthetic. He was uniformly kind and tolerant of the opinion and conduct of others. He was always able to find something good in his fellow man or some excuse for his supposed short comings. He will of course, be remembered for many reasons by many people; but certain it is, that his tolerance of others and his desire to help those less fortunate in life, will remain as outstanding characteristics in the memories of his many, many friends, colleagues and patients. Such a man as our late Fellow was, could only be produced in the democratic way of life. Let us hope, work, make sacrifices and fight if need be, for its continuance, so that others may follow, like unto Bob Torrey.

## BIOGRAPHICAL DATA

*Professional positions:* Associate in Medicine, Univ. of Pa., 1915; Assoc. Prof., Graduate School, 1923–1931; Prof. Principles and Practice of Medicine, Woman's Medical College, 1931–1941; Visiting physician, Phila. Gen. Hosp., 1915, St. Mary's Hosp.; Consulting phys., Delaware County Hosp., Pennsylvania State Hosp. for the Insane, Norristown; Physician, Hosp. Woman's Medical College, 1931–1941; Chief medical examiner, Phila. Dep't of Health, Div. of Tuberculosis.

*Scientific societies:* College of Physicians of Philadelphia, 1912–1941 (Councillor, 1932–4; ch'n, Comm. on Mary Scott Newbold Lectures, 1936–8); Am. Coll. Phys.; Pathological Soc. of Phila.; Am. Heart Assoc.; Am. Rheumatism Assoc.; John Morgan Soc. (one-time pres.).

*Fraternities:* Alpha Mu Pi Omega; Psi Upsilon.

*War service:* Capt. and Major, M. C., U. S. Army.

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# Transactions of the Sections

## SECTION ON GENERAL MEDICINE

*Regular Meeting, March 24, 1941*

Mikulicz' Disease. James A. Lehman*, M.D., and William G. Leaman, jr, M.D. (*Abstract 1, below.*)

Experiences with the Intravenous Use of Cardio-active Glucosides. Joseph B. Vander Veer, M.D., and Joseph A. Wagner*, M.D. (*Abstract 2, below.*)

The Effect of Low Calcium Diet and Large Doses of Calciferol (Vitamin D) in Chronic Hypoparathyroidism. Edward Rose, M.D., William H. Perloff*, M.D., and F. William Sunderman, M.D. (*Abstract 3, below.*)

The Effect of Tobacco Smoke and Nicotine upon the Normal Heart and in the Presence of Myocardial Disease: a Clinical and Experimental Study. Samuel Bellet*, M.D., Richard H. Mead, jr, M.D., Alfred Kershbaum*, M.D., and Leon Schwartz*, M.D. (*Abstract 4, below.*)

*Regular Meeting, April 28, 1941*

Meningococcal Meningitis. Report of Fifty Cases Treated with Serum and Sulfanilamide. Eugene P. Campbell*, M.D. (*Abstract 5, below.*)

A New Test for Liver and Gallbladder Function. Lester M. Morrison*, M.D. (*Abstract 6, below.*)

Studies in Capillary Mobility, Minute Vessel Pressure, Cutaneous Lymph Flow and Blood Volume in Relation to the Effectiveness of Thiocyanate Therapy. M. August Lindauer, M.D., John Q. Griffith, jr, M.D., Ella Roberts, M.D., and Robert B. Rutherford*, M.D. (*Abstract 7, below.*)

Hemochromatosis. Joseph T. Beardwood, jr, M.D., and George P. Rouse*, M.D.

*Regular Meeting, May 26, 1941*

The Lung in Artificial Pneumothorax; Studies on Thirty Postmortem Cases. Robert Charr, M.D., and J. W. Savacool*, M.D. (*Abstract 8, below.*)

The Reaction to Exercise in Cases of Auricular Fibrillation; Its Relation to Digitalis Therapy. Louis B. Laplace, M.D. (*Abstract 9, below.*)

A Correlation of the Velocity of Blood Flow and the Basal Metabolic Rate in Various Metabolic Disorders. Samuel Baer*, M.D., and Harold J. Isard*, M.D. (*Abstract 10, below.*)

A Theory Explaining the Abnormal Gastric Motor and Secretory Phenomena in Duodenal Ulcer. Harry Shay*, M.D., and J. Gershon-Cohen*, M.D. (*Abstract 11, below.*)

## SECTION ON MEDICAL HISTORY

*Regular Meeting, April 14, 1941*

The Advent of Modern Medicine in Philadelphia (1815–1850). Richard H. Shryock*, PH.D.

## SECTION ON OPHTHALMOLOGY[1]

*Regular Meeting, March 20, 1941*

Melanoma of the Conjunctiva with Orbital Involvement: Case Report. Wilfred E. Fry, M.D.

* *By invitation.*

[1] The transactions of this Section are abstracted in the *American Journal of Ophthalmology* and the *Archives of Ophthalmology.*

Melanoma of the Eye, Intra- and Epibulbar. J. E. Ash*, M.D., Lieut. Col., M.C., U. S. A.

*Regular Meeting, April 17, 1941*

Is Enucleation Indicated in Early Malignant Melanoma? Report of Two Cases. Louis Lehrfeld, M.D.

Operative Treatment of Early Strabismus. Glen G. Gibson, M.D.

The Penetration of Sulfonamide Drugs into the Aqueous Humor. Harold G. Scheie*, M.D., and Benjamin F. Souders*, M.D.

## SECTION ON OTOLARYNGOLOGY[2]

*Meeting, March 19, 1941*[3]

Some Interrelationships of Otolaryngology and Hematology. Thomas Fitz-Hugh, jr, M.D.

Some External Nasal Deformities and Methods Used in Their Repair. Warren B. Davis, M.D.

The Toxicology and Pharmacology of the Sulfonamide Compounds. Harrison F. Flippin, M.D.

*Regular Meeting, April 16, 1941*

Report of a Case of Neurofibroma of the Larynx. Emily Lois Van Loon, M.D.

Cerebellar Abscess. Benjamin H. Shuster, M.D.

Report of a Case of Unusual Mobility of the Tongue. Louis E. Silcox, M.D.

Percussion Note over the Maxilla as a Differential Diagnostic Sign. William Hewson, M.D.

* *By invitation.*

[2] The transactions of this Section are abstracted in the *Archives of Otolaryngology*.

[3] Joint meeting with the Section on Otolaryngology of the New York Academy of Medicine.

## SECTION ON PUBLIC HEALTH, PREVENTIVE AND INDUSTRIAL MEDICINE

*Meeting, April 7, 1941*

The Sulfonamides in Public Health and Preventive Medicine

Public Health Aspects of the Sulfonamides in Relation to Gonorrhea. Percy S. Pelouze, M.D.

The Prophylactic Use of Sulfanilamide in Rheumatic Fever. Caroline C. B. Thomas*, M.D.

The Effect of the Sulfonamides on the Mortality of Pneumonia and Other Infections. Harrison F. Flippin, M.D.

## ABSTRACTS

1. Mikulicz' Disease. James A. Lehman, M.D., and William G. Leaman, jr, M.D.

Mikulicz in 1888 first described in clear-cut manner the disease picture that bears his name. He stated: "Both lacrymal glands and all the salivary glands are changed in a symmetrical way into tumors that distort the physiognomy. These tumors arise gradually, are of a hard consistency and without trace of inflammatory signs. Elsewhere there are no pathological changes in the bearer of these tumors." True Mikulicz' Disease is rare. A case is reported that has been under the care of the authors for the past 11 years and presents the picture of this chronic, benign condition as originally described. The case record is of additional interest from the standpoint of differential diagnosis, especially in the early stages of the disease. The etiology, pathology, diagnosis and treatment of Mikulicz' Disease are discussed. The authors call attention to what they believe is the typical appearance of the

* *By invitation.*

mouth and tongue in the advanced stages of the disease.

2. Experiences with the Intravenous Use of Cardio-active Glucosides.* Joseph B. Vander Veer, M.D., and Joseph A. Wagner, M.D.

In the therapy of severe cardiac failure, the use of digitalis or drugs with digitalis-like action is very important. In occasional patients, the intravenous use of preparations of this type may be desirable and, perhaps, even life-saving. A review of the recent literature on this subject reveals a variety of opinion as to the best drug to use on such occasions. Preparations of strophanthus are most often given first choice, although preparations of digitalis purpurea or lanata containing one or more of the cardio-active glucosides are frequently advocated.

During the past eight years at the Pennsylvania Hospital, the authors have treated twenty severely ill patients with Digalen, a preparation of the cardio-active glucosides of digitalis purpurea, given intravenously in doses of 4 to 8 cat units (8 to 12 grain equivalents). Other forms of therapy (morphine, oxygen, phlebotomy, etc.) frequently were instituted at once because of the condition of the patient.

The best results were seen in those patients with rheumatic heart disease with auricular fibrillation and a rapid ventricular rate. Studies with several different cardio-active glucosides from different plants were made on one patient under more controlled conditions.

In our experience, the intravenous use of a digitalis preparation (4 cat unit doses) in *selected* cases of severe cardiac failure is safe and often rapidly effective. Further clinical studies on the various *individual* cardio-active glucosides are indicated to determine their exact therapeutic properties on the diseased human heart.

* From the Pennsylvania Hospital.

3. The Effect of Low Calcium Diet and Large Doses of Calciferol (Vitamin D) in Chronic Hypoparathyroidism. Edward Rose, M.D., William H. Perloff, M.D., and F. William Sunderman, M.D.

Studies of calcium and phosphorus metabolism in three subjects are reported; two patients with chronic hypoparathyroidism and one 'normal' control. These patients were all kept on similar diets, low in calcium and moderate in phosphorus, and observed before and after the administration of large doses (400,000 vitamin D units daily) of calciferol.

Contrary to previous opinion, patients with parathyroid insufficiency may show a negative calcium balance when receiving diets low in calcium, containing a low calcium-phosphorus ratio. The shift in the excretion of calcium and phosphorus from feces to urine after calciferol therapy, previously described by others, is confirmed.

Large oral doses of calciferol (vitamin $D_2$) are effective in restoring normal concentration of calcium and inorganic phosphorus in the serum and in relieving symptoms in patients with chronic parathyroid insufficiency.

The effective action of calciferol in such patients depends neither upon a normal calcium intake nor upon a normal calcium-phosphorus ratio in the diet.

Changes in the 'normal' subject were qualitatively similar to those seen in the patients with hypoparathyroidism.

4. The Effect of Tobacco Smoke and Nicotine upon the Normal Heart and in the Presence of Myocardial

Disease: A Clinical and Experimental Study.* Samuel Bellet, M.D., Richard H. Meade, Jr., M.D., Alfred Kershbaum, M.D., and Leon Schwartz, M.D.

The object of this study was to determine whether or not a difference in tolerance to tobacco smoke and nicotine exists in the normal heart as compared to hearts with myocardial damage.

(a) Experimental: The unanesthetized dog was used in all experiments. The effects of inhalation of tobacco smoke and injection of nicotine in various doses on the electrocardiogram of the normal dog were first determined. Myocardial damage was then produced by ligation of the anterior descending branch of the left coronary artery and its accompanying vein. Such a preparation presents the opportunity for studying the effects of nicotine in the presence of acute infarction (1 to 4 days), subacute infarction (5 to 11 days) and chronic infarction (after 18 days). It was found that normal animals were able to receive doses from 0.2 to 0.8 mg./kilo with development of relatively slight electrocardiographic effects. Following coronary ligation, severe effects were observed with a dose of 0.2 mg./kilo in most of the animals in the acute stage. These effects became less marked as the chronic stage of infarction was reached. However the effects were more marked in the chronic stage than in the normal control. A parallel apparently existed between the severity of the electrocardiographic effects and the grade of myocardial disease.

(b) Clinical: The tolerance to smoking was investigated in a group of 350 patients (ages 30–75) with cardiovascular disease of various etiologies and compared with cases of a similar group, presenting no obvious heart disease. In addition, electrocardiographic studies were performed during smoking. It was found that symptoms such as precordial discomfort, palpitation and shortness of breath following smoking occurred in approximately 10% in the normal group as compared to 27% in the group with myocardial damage. In addition, 4 cases of angina were observed in the latter group. Electrocardiograms taken during smoking showed alterations, particularly in the group with myocardial damage.

* From the Robinette Foundation and Department of Surgical Research, University of Pennsylvania and Philadelphia General Hospital.

5. Meningococcal Meningitis. Report of Fifty Cases Treated with Serum and Sulfanilamide.* Eugene P. Campbell, M.D.

Fifty cases of meningococcal meningitis occurring between May, 1935, and May, 1939, were analyzed from the standpoint of the results of treatment. In one group of 40 patients, anti-meningococcal serum was given intravenously, intrathecally and intramuscularly. There were 20 deaths in this group. Five of these deaths were caused by fulminating infections, and, if they are excluded, the fatality rate would be 42.8%.

The second group, of 10 cases, was treated with anti-meningococcal serum, in the same fashion as outlined above, plus sulfanilamide. No deaths occurred in this group. The sulfanilamide was given in a large initial dose followed by smaller doses every four hours. The total amounts of sulfanilamide given ranged between 10–25 grams. The results of treatment of meningococcal meningitis during the past four years with serum, sulfanilamide, sulfapyridine

* From the Medical Service of the Philadelphia General Hospital, under the directorship of Dr. Russell S. Boles.

and sulfathiazole were summarized from the literature.

Two family units had three cases each. Three patients each had two separate attacks. In four patients, mild attacks followed what appeared to be meningococcemia. The rather high incidence of family cases, recurring attacks and meningococcemia suggest the need for further study of this disease in order to clarify some of its obscure immunological features.

It was concluded from this study that even though the groups of cases were small there was a significant decrease in fatality due to the use of sulfanilamide.

6. A New Test for Liver and Gallbladder Function. Lester M. Morrison, M.D.

1. The bile salt concentration in the bile obtained by surgical and non-surgical drainage and urine from patients with normal and with diseased or poorly functioning livers was studied by a surface tension method employing a stalagmometer.

2. The bile salt concentration in the bile obtained by surgical and non-surgical biliary drainage is believed to be a most sensitive physiologic index to the function of the liver in health and disease.

3. (a) The bile salt concentration in surgical drainage bile from normal livers was found to average 1800 mg. per 100 cc. bile.

(b) The same concentration in surgical drainage bile from a series of patients with pathologic livers has been found to average 740 mg.

4. (a) The concentration in representative non-surgical drainage bile from patients with normal livers was found to have an average normal figure of 1200 mg. This was taken from the combined gallbladder, "B," and liver, "C," biles, although figures above 1200 mg. were often obtained.

(b) Diseased or poorly functioning livers had an impairment in the power to concentrate bile salts, with an average of 800 mg. in the combined "BC" biles.

(c) The normal bile salt concentration from liver, or "C," bile in the non-surgical bile drainage was found to be 400 mg. and over. The pathologic or dysfunctioning liver showed impaired concentrating ability, falling below 400 mg.

5. (a) The bile salt concentration in the urines of persons free from liver disease or dysfunction varied from 10 mg. to 350 per 100 cc. urine. There may be an isolated sporadic rise in the normal up to 400 mg.

(b) The bile salt concentration in the urine of persons with liver disease or poor liver function was often above 400 mg. per 100 cc. urine. The bile salt excretion in urine is not as sensitive an index to liver disturbances as is the bile salt concentration in the bile obtained by surgical or non-surgical drainage. Not infrequently the urinary bile salts are normal in non-jaundiced patients with hepatic dysfunction.

6. For practical clinical purposes, the test consists of determining the specific gravity of the "B," or gallbladder, bile and comparing it with the "C," or liver, bile in the non-surgical biliary drainage. The specific gravity of normal gallbladder bile is from 0.005 to 0.050 volumes greater than that of the liver bile.

The specific gravity of the "B" bile from the diseased gallbladder falls into three categories: a) it is less than the specific gravity of the liver bile; b) it equals the specific gravity of the liver bile; or c), it is only from 0.001 to 0.004 volumes greater than the specific gravity of the liver bile.

7. Studies in Capillary Mobility, Minute Vessel Pressure, Cutaneous Lymph Flow and Blood Volume in Relation to the Effectiveness of Thiocyanate Therapy. M. August Lindauer, M.D., John Q. Griffith, jr, M.D., Ella Roberts, M.D., and Robert B. Rutherford, M.D.

From the small series of patients studied, absolute conclusions could not be drawn. However, it is possible to conclude that the administration of thiocyanate is most likely to be efficacious in the treatment of hypertension if the minute vessel pressure is normal and the capillary count and minute vessel pressure react normally to histamine. Any variation from the normal response to the various tests which we employed makes success less likely. The treatment is least likely to succeed when an elevated minute vessel pressure is associated with increased cutaneous lymphatic flow or when papilledema is present.

8. The Lung in Artificial Pneumothorax; Studies on Thirty Post-mortem Cases. Robert Charr, M.D., and J. W. Savacool, M.D.

Post-mortem observations of the changes in the various structures in the lungs of 30 patients treated with artificial pneumothorax are reported. Ten of the patients also had phrenic nerve paralysis.

Pleural changes consist of inflammation, minimal in uncomplicated cases but severe where acute tuberculous lesions lie beneath the pleura. Chronic inflammation in long-standing cases was intensified by pleural effusions and extensive tuberculosis in the underlying lung. Subpleural tubercles appear significant in this connection. It is suggested that effusions occur largely as a result of pathological changes in the pleura. Purulent fluid in the pleural cavity has no eroding effect on the lung.

Occlusion of diseased bronchioles with atelectasis soon after induction of pneumothorax is suggested as a probable mechanism of selective collapse.

Bronchial changes frequently depend upon tuberculosis in the peripheral bronchi, especially those draining cavities. These changes may account for failure of the cavities to drain and for their dilatation when air cannot escape. Several types of such valve mechanisms are discussed.

Vascular changes in the lung may be definitely related to cavity healing. Thrombosis of the arterial branches at times extends to the main trunk and this occurs more commonly on the right side.

Cavity closure, when blood supply is adequate, takes place by progressive concentric collapse and fibrosis. In chronic fibrotic cavities, flattening of the cavity with collapse from side to side does not promote anatomic healing.

Phrenic nerve operation supplementing pneumothorax brings about less marked anatomic changes. Phrenic crush results in more marked rise of the posterior portion of the diaphragm than of the anterior portion.

Very few effects on the normal portions of the lungs were noted, suggesting that the disease process is largely responsible for the changes noted and the pneumothorax itself accounts for few of these changes.

9. The Reaction to Exercise in Cases of Auricular Fibrillation; Its Relation to Digitalis Therapy. Louis B. Laplace, M.D.

A study of the heart rate during and after performance of a standard exercise indicates that patients who have auricular fibrillation differ widely in their reaction

to physical exertion. Patients whose a-v conduction is relatively impaired have a slow ventricular rate at rest and during exercise; those whose a-v conduction is unimpaired but whose vagal tonus is pronounced have a slow ventricular rate at rest and a fast rate during exercise; those whose a-v conduction is unimpaired and whose vagal tonus is slight have a fast ventricular rate at rest and during exercise.

Digitalis, when administered for the purpose of controlling the ventricular rate in cases of auricular fibrillation, is always indicated when the resting rate is fast, but is useless when both the resting and exercise rates are slow. It is also indicated when the exercise rate is fast, even if the resting rate is slow. It is emphasized that cases of the latter type can be recognized only by some form of evaluation of the patient's reaction to exercise.

The vagal effect of digitalis is usually elicited by a smaller dosage than is the effect on a-v conduction. For this reason, withdrawal of digitalis may not be manifested by conspicuous acceleration of the ventricular rate at rest until some time after the rate during exercise has become abnormally fast.

Two brands of digitalis were studied with respect to their influence on the reaction to exercise, and a difference in their clinical potency was demonstrated which was not apparent from the cat unit method of standardization.

10. A Correlation of the Velocity of Blood Flow and the Basal Metabolic Rate in Various Metabolic Disorders. Samuel Baer, M.D., and Harold J. Isard, M.D.

An attempt has been made to determine what correlation, if any, existed between the basal metabolic rate and the velocity of blood flow. Basal metabolic rates and circulation times were determined in 187 patients. Injecting 4 c.c. of a 20% solution of calcium gluconate intravenously, the circulation time was measured from the instant the injection was begun until the patient noticed a sensation of heat in the oropharynx.

In 227 trials, the normal arm-to-tongue time varied from 9 to 16 seconds, with an average of 12.1 seconds. In 24 patients with hyperthyroidism, the average circulation time was 8.9 seconds, and in hypothyroidism the circulation time was usually prolonged beyond 16 seconds. Thus, the velocity of blood flow is increased in hyperthyroidism and decreased in hypothyroidism.

In cases of polyglandular dystrophy, however, or those patients with menopausal syndromes and hypertension, the calcium gluconate circulation time bears no relation whatsoever to the B.M.R. In children, irrespective of the basal metabolic rate, the velocity of blood flow is increased.

The authors feel that the determination of the velocity of blood flow may be of some help in the diagnosis of thyroid gland disturbances. A basal metabolic rate of plus 20 or above, and an arm-to-tongue circulation time of 10 seconds or below, is strongly suggestive of active hyperthyroidism.

11. A Theory Explaining the Abnormal Gastric Motor and Secretory Phenomena in Duodenal Ulcer. Harry Shay, M.D., and J. Gershon-Cohen, M.D.

By a direct approach in the human subject we have demonstrated the presence in the normal duodenum of a mechanism which is brought into play by a concentration of acid peculiar to the individual. This concentration, for any meal, is

represented by the peak of free acidity reached after the particular meal. When this concentration of acid reaches the duodenum a mechanism is activated that depresses gastric secretion and is responsible for the descending limb of the normal gastric curve.

In the failure of the normal response of such a mechanism, obtunded by the ulceration and inflammation produced by duodenal ulcer, we believe lies the explanation for the high acid extra-gastric curve seen in this disease. That such a failure of response does occur we have demonstrated in duodenal ulcer patients. If we combine our present findings regarding gastric secretion with the influence of the duodenum upon gastric motor function which we have previously described, we have for the first time, in the disturbance of one mechanism, an explanation for the characteristic clinical gastric findings in uncomplicated duodenal ulcer—hyperperistalsis, hypertonicity, hypermotility and hypersecretion.

# Notes from the Library and the Mütter Museum

## THE LIBRARY

### A 'SIX AGES OF THE WORLD'-DATING OF OUR 13TH CENTURY MANUSCRIPT OF THE *Viaticum Constantini*

SIX 13th century manuscripts of the *Viaticum Constantini*—a popular medical handbook for travelers, written by Ibn al-Jazzār in the 10th century and translated into Latin by Constantinus Africanus in the 11th—are recorded by S. De Ricci and W. J. Wilson in their *Census of medieval and renaissance manuscripts in the United States and Canada*[1]. If they are ascribed to the 13th century on grounds other than those of general characteristics, there is no evidence to that effect in the listings.

One of these manuscripts, purchased in 1921, is in the library of the College[2]. The volume contains, in addition to the *Viaticum*[3], and written in the same hand, the *Antidotarium* (12th century) of Nicolaus Salernitanus, the only complete Latin manuscript of the work listed in the De Ricci and Wilson *Census*.

Consulting this volume one day, I noticed, below the scribe's joyous *Laus Christo* at having finished his copying of the *Antidotarium*, what appeared to be twenty-three lines of verse, the writing faint and viciously contracted—far less legible than the beautiful text produced by the professional scribe. Nevertheless, it was clear from the more legible words—*prima etas*, *secunda etas*, etc.—and from the recurrence of numerals that some early owner had felt impelled to enter in his book one of the mediaeval divisions of historical time into epochs, or ages; and it was equally clear that this irrelevant performance might very well culminate in an announcement of the scribbler's own place in the chronological scheme.

As it happened, working in the library at the time was a good friend, Dean P. Lockwood, professor of Latin at Haverford College, who, quickly conscripted, very kindly read off the text in impeccable, uncontracted Latin. The following transcription, then, we owe to him. It shows that the early owner of the volume wrote in his description of the six ages of the world in the year 1244, which furnishes a *terminus ante quem*, at least, for one of the six *Viaticum* manuscripts known to reside in the United States or Canada.

#### LATIN TEXT

Prima etas ab adam usque noe
continens annos. m. cccccc. lvi.
que tota periit tempore diluuij.

Secunda etas. a noe usque ad abraam.
.cc. nonaginta vi. annos habens.
que in lingua ebrea inventa est.

Tertia ab abraam usque david nonagintos. xl. annos continens.

[1] 3. vols. New York, H. W. Wilson Co., 1935–1940.

[2] De Ricci and Wilson's *Census*, vol. 2, p. 2010

[3] For an account of another 13th century manuscript of this work, see Henry E. Sigerist, "Rare books in the Welch medical library. 3. The Crummer manuscript", in *Bulletin of the Institute of the History of Medicine, The Johns Hopkins University*, 1936, **4**, 335–339.

Quarta a david usque ad transmigrationem
babillonis. cccc. octuaginta tres
annos continens.
Quinta a transmigratione babillonis usque
ad adventum Salvatoris in carne
quingentos octuaginta novem annos
continens.
Sexta ab incarnatione nostri domini usque modo
.m.cc.xl. & iiij. ut medio de martio expleatur. quia mundus de martij medietate principium habuit. & summa
omnium annorum s. etates est quinque
milia. cc. viij anni. & finis vero mundi huius usque ad. cccc. xij.
annos ad plus.

TRANSLATION

First age from Adam to Noah, containing 1656 years.
This disappeared totally at the time of the flood.
Second age from Noah to Abraham, having 296 years.
Which in the Hebrew tongue was found.
The third from Abraham to David, containing 940 years.
The fourth from David to the Babylonian transmigration, containing 483 years.
The fifth from the Babylonian transmigration to the advent of the Savior in the flesh, containing 589 years.
The sixth from the incarnation of our Lord until now, 1244, reckoning from the middle of March. Because the world had its beginning in the middle of March. And the sum of all the years, that is, the ages, is 5,208 years, and the end, in truth, of this world [adds] up to 412 years more.

W. B. McD., 2D

THE RECEIPT OF FOREIGN PERIODICALS

In June 1940, following the invasion of Belgium, the Netherlands, and France, shipments of foreign periodicals from our agent in Amsterdam ceased until autumn. Since then we have received shipments of about 40 parcels each in November, January, and April—in each shipment some 450 separate numbers of journals published in 1940, including many November and December issues; a total of some 1300 issues.

In June 1941 we received 56 parcels containing 644 separate numbers, of which some hundred were French journals issued in 1940; a further considerable number were German journals published in 1941. In July 1941 further shipments were received.

The earlier of these shipments were sent through Lisbon, and 7 parcels failed to come through to us. The later shipments came by way of Siberia, with the loss of only one parcel. This latter route also has now been closed to us.

R. H. B.

## MÜTTER MUSEUM

ACQUISITIONS TO THE PERMANENT COLLECTION

An unusual pocket stethoscope. Presented by Myer Solis-Cohen, M.D.

A stethoscope containing a clinical thermometer. Presented by David W. Ashkenaz, Ph.D.

An Italian helmet used in the last World War. Presented by Mr. Robert G. Muir.

The following instruments were presented by Elliston J. Morris, M. D.: Faught blood pressure apparatus; an insufflator; a centrifuge operated by water power and one operated by hand; hand-

forged forceps; three Levis metallic splints; a clinical and a Fahrenheit thermometer; a box containing the original adhesive tape, brought from Edinburgh in 1886 by Dr. Morris; a bandage winder; a very old galvanic battery set; a sphygmograph that was once the property of Dr. J. Cheston Morris and used in 1872; two rectal syringes of French manufacture.

### MUSEUM CATALOGUE

Three volumes of the Museum catalogue have been completed.

# Notes on the Fellowship

*Elected to Fellowship*

(May 7, 1941)

Jacob Gershon-Cohen
Joseph I. Gouterman
Stoughton Ralph Vogel
C. Wilmer Wirts, jr.

*Necrological List*

| | |
|---|---|
| A. Graeme Mitchell* | June 1, 1941 |
| Henry K. Mohler | May 16, 1941 |
| Arthur Newlin | April 13, 1941 |
| John J. Shaw | June 24, 1941 |
| James E. Talley | July 7, 1941 |

*Non-resident Fellow.

TRANSACTIONS & STUDIES

*of the*

College of Physicians of Philadelphia

Volume 9 (Fourth Series)

Number 3 (December 1941)

# The Influence of Foster Nursing on Experimental Breast Cancer[1,2]

*By* JOHN J. BITTNER, PH. D.

*Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine*

MICE have been used in studies on experimental cancer for over fifty years. As most of the early work was completed before the rediscovery of Mendel's investigations, the principles of genetics could not be applied. Little attention was given to strains and the animals generally were obtained from dealers. Unfortunately, some of the more recent publications have been based on the use of material which was not homozygous.

To obtain this homozygous condition in animals it is necessary to employ close inbreeding. Matings may be made between brothers and sisters or parents by offspring and should be continued for at least 20 generations. This process of inbreeding is a long, tedious procedure and, in mice, which breed rapidly when compared with some of the other animals, requires about seven years. The strain may now be available for scientific use after observations have been completed on the characteristics which are inherited. For studies on spontaneous cancer this means an additional delay of three years or approximately ten years from the time of the origin of a stock of mice.

Through the foresight of a small group of geneticists (Little, Strong, MacDowell, Lynch, and others) inbred strains of mice have become available to the younger workers in the cancer and other fields of biological research. To their pioneer work in the development of different strains of mice must be credited many of the recent advances in medical knowledge

Haldane (1) commented on the work on cancer (or other biological problem) which was completed on heterozygous material ("market mice") in the following statement: ". . . But all work with genetically heterozygous material is unsatisfactory, because any individual may die

[1] *Alvarenga Prize Lecture II (Award XXXVI)*, The College of Physicians of Philadelphia, October 1, 1941.

[2] Assisted by grants from the National Cancer Institute, The Jane Coffin Childs Memorial Fund for Medical Research and The International Cancer Research Foundation.

before reaching the cancer age, and no other individual will be of just the same genetical make-up. Hence really exact work is impossible."

Inbred strains of mice were first used in the problem on cancer for transplantation studies, but it was not until 1924 that the genetic theory of the transplantation of neoplastic tissue was advanced by Little and Strong (2). In a review of the data on the genetics of transplantation it was found that 31 tumors of the breast had been studied which had developed in inbred animals. These tumors had been grafted into 8,508 hosts and only 0.42% of the inoculations gave exceptional results (progressive growth in expected resistant mice and no growth in expected susceptible animals) (3).

Cancer of the mammary gland in mice has been the subject of numerous publications. The reasons for the use of this particular type are manifold: the tumors develop rather early in the life of the animals, they are easily detected, and, in some strains, the incidence may be as high in virgin as in breeding females (4, 5). Other strains may have a high incidence in breeding females and a low incidence in virgin females (6). On the other hand, these growths are normally limited to female mice.

The history of the study of spontaneous carcinoma of the mammary gland is similar to that of the transplantation of tumors. For this reason only those experiments completed with mice of *inbred* strains will be mentioned, as exact work is impossible with other material (1).

The early work on breast tumors in mice, as well as other forms of cancer, was of great value because it showed that some strains had higher incidences of certain types of tumors than did other stocks and thus evidence of the importance of heredity was obtained.

The first manuscript on crosses between strains of inbred mice having high and low[3] incidences of breast cancer was published in 1933 (7). Four reciprocal crosses were made between 3 strains of mice having high incidences and 4 strains having low incidences of breast tumors. In every cross the females of the first hybrid generation which had maternal parents from the strains with high incidences also developed tumors; the hybrids which had maternal parents from the low strains showed few growths. To account for these results the extra-chromosomal or maternal theory was proposed to explain, in part, the etiology of breast cancer, at least, in mice.

Early in 1934 similar results for one of the crosses was reported by Korteweg (8), using mice which had been sent from this laboratory. Several other publications supporting this theory should also be listed (9–16).

The extra-chromosomal theory has at least three possible explanations. As the "influence" may be transferred only by the female parent, it may be passed to the progeny by means of: (a) the cytoplasm or cytoplasmic inheritance, (b) during intra-uterine development, and (c) by way of the mother's milk while nursing. The present work stresses the importance of nursing on the development of breast tumors. Van Gulik and Korteweg (16) are of the opinion that a uterine stimulus also should be considered.

Most workers believe that the various types of cancer should not be considered as a single disease. There is also some evidence that there may be two or more types of breast tumors. Strong (17) showed that in an inbred strain of mice having a high incidence of breast tumors,

[3] No inbred strain of mice has been reported which has been tested to be non-breast cancerous over a period of years.

non-cancerous mothers generally have progeny which are cancerous. These observations have been confirmed for other strains or for sub-lines of the same strain (18). In a strain having a low incidence and considered to be non-susceptible for the development of breast tumors, there is no published evidence that the incidence of cancer of the breast will be any higher among the progeny of cancerous than non-cancerous mothers. This will be considered in more detail later.

For the development of that type of breast cancer which is usually observed in strains having a high incidence and their hybrids (transferred to the progeny or inherited), at least three "influences" must be present and active. These may be (19):

1. An influence in the milk of females of cancerous strains which is usually transferred to the young while nursing.

2. An inherited susceptibility for the development of spontaneous carcinoma of the breast. This susceptibility is dominant and the data secured to date are in accord with the genetic theory that it may be a single factor. Further work is in progress to test this hypothesis.

3. The hormonal stimulation of the mammary tissue resulting in the growth of the glands so the cancerous change may take place. The amount needed for the development of the glands varies with the strain of mice which is being considered.

There are also observations that the incidence may be modified by the physiology of the individual (20) and by diet (21, 22, 23).

The strains of mice which have been used in these experiments are the "A" and C3H ("Z") stocks with high incidences and the C57 black ("B") and CBA ("X") strains with low incidences of breast tumors. The "B" strain was started by Little (24) and the others by Strong (25–27). All of these strains have been inbred for over 15 years and over 30 successive generations of spontaneous breast tumors have been observed in mice of the cancerous strains.

The author's line of mice of the A stock was obtained from Strong in 1927. It was first used for studies on transplantation (28). Various incidences of breast tumors have been reported. When the strain was maintained on an oatmeal diet the incidence for 421 breeding females was 63.9% (average age 12.3 months) (29). Following a change to the Purina Fox Chow diet the incidence increased to 88.0% (292 mice) and the average age of the mice at the time of the appearance of their tumors was 11.5 months (21). An increased number of mice (1093) gave an incidence of 83.6%—average age 11.1 months (15).

In this strain only one subline has been continued; the side-lines were discarded as soon as the selected line was well established. The above data for the A stock included all mice. If the animals are selected to include only the first generation progeny of the female which was used to continue the stock in each generation and her litter mates, the incidence is considerably higher. For breeding females of the $F_{38}$-$F_{44}$ generations the incidence was 95.1% and from the $F_{45}$-$F_{58}$ generations 96.7% (30). The respective average ages were 12.2 and 9.3 months. Thus, had the sublines been continued as such, differences might have resulted in the incidences even after 38 generations of inbreeding. A lowering of the average tumor age was noted.

Virgin females of the A stock had an incidence of 4.9%, average age 18.5 months (6).

Andervont and McEleney (4 and 31) reported an increase in the incidence and a lowering of the average age in mice of

the C3H strain following continued inbreeding. In one report all of the females, breeders and virgins, developed tumors at the respective ages of 9.5 and 11.5 months.

Recently Andervont (5) found that the breeding females of the C3H stock, representatives of 27 inbred generations, gave an incidence of 91.4% for 1588 mice and observations on the virgin females of the 12th–25th generations resulted in 97.4% being cancerous. The average ages for tumors were 8.6 and 10.4 months. The higher incidence in the virgin females was probably due to the increased viability of the mice of this group. In both classes there was a tendency for the average tumor ages to decrease with continued inbreeding.

In our strain of C3H mice the incidence for breeding females of a selected subline is about 97%, average age 10.0 months (30). Virgin females have not been studied.

The incidence of breast tumors in breeding females of the C57 black strain is 0.5% and none of the virgin females which were observed had growths (24). The incidence for mice of the CBA strain is somewhat higher (27, 18).

While it is evident that inbred strains of mice are to the biologist what pure chemicals are to the chemist, they are not "stable" and mutational changes may occur at any time. To detect these variations it is necessary to maintain a considerable number of controls at all times. Thus, mice which were used as controls for one experiment may not be satisfactory as controls for another series of studies and controls raised in one laboratory are unsatisfactory for investigations on mice of the same strain completed at another station.

If mice of the A cancerous strain are removed from their potentially cancerous mothers soon after birth (within 24 hours) and placed with lactating females of a strain having a low incidence of breast cancer, a reduction in the incidence has been noted (32, subject reviewed in 15). These fostered mice were used as breeders (unless otherwise stated, all the females used in these experiments produced progeny).

Only *one generation* of mice of the A stock was fostered. The incidence was 7.9% for 127 breeding females, average tumor age 11.2 months and the average age of the non-cancerous mice, 17.7 months.

A few of these fostered mice developed tumors. Their progeny were continued for several generations and the young nursed their maternal parents. The incidence among the progeny of the first generation approached the incidence of the control strain but with each succeeding generation there was a gradual reduction in the proportion of mice developing tumors. A few of the fostered females which were non-cancerous gave similar results. These were usually litter mates of the fostered mice which were cancerous. Fostered mice which were non-cancerous generally had progeny which were also non-cancerous.

If the young of the females of the cancerous strain were permitted to remain with their mothers for longer than 24 hours after birth before they were fostered, no significant reduction in the incidence of breast tumors was noted (33).

These results indicated that there was some "influence"[4] transferred in the milk

[4] The word "influence" was adopted because the importance of nursing was not at first realized and because we were unable to define the material in the milk which aided in the genesis of breast cancer. "Factor" has been suggested but has not been used for, to a biologist, a geneticist in particular, this word implies that it is transmitted through the

of the cancerous mothers which was of importance in the development of breast cancer. The influence was present in the first milk, in milk obtained several days after the birth of a litter, and, as found in the work of others, was active during the entire nursing period (4, 33, 35).

Because the progeny of the fostered mice of the cancerous strain which had remained with their maternal parents for less than 24 hours and later had tumors, showed a lower incidence than did mice which nursed their cancerous parents for a longer period, it was apparent that the amount of milk the young obtained from their cancerous mothers might determine the incidence of breast tumors.

A group of 26 mice, 4–5 weeks of age, was given an average of 0.9–1.0 c.c. of milk secured from lactating females of the cancerous A strain. The tumor incidence was 50% and the average age 11.4 months. Another group received 1.75 c.c. and the observed incidence was 68%, average age 11.2 months. In these experiments the milk was given to fostered mice of cancerous strains which had been without water for about 20 hours (34). Other mice received macerated liver from the same donors, the amount given per mouse being 5 c.c. Tumors did not develop in any of these mice although they survived to an average age of 17.7 months. Growths developed in some mice which had received grafts of spleen and thymus from donors of the cancerous stock (15). Apparently, the amount of milk secured by the mice while nursing does control, to some extent, the incidence and may have some bearing on the time of development of the tumors as expressed by the average tumor ages. The influence is also present in some of the organs of mice of cancerous strains but is either absent or has been destroyed in others, as the liver.

The incidence of breast tumors in breeding females of the C57 black (B) strain, as recorded by Little, Murray and Cloudman (24), was 0.5% in a group of 568 animals. If the new born progeny of females of this strain are given for nursing to females of strains having a high incidence of breast tumors, the incidences recorded in the fostered females and their progeny was 10.6% (15). Of interest was the observation that the incidence was not significantly higher among the progeny of the cancerous females than for the progeny of the non-cancerous mothers. As mentioned above, in a high tumor strain the progeny of non-cancerous mothers are generally cancerous.

The fostered females of the C57 black strain did receive the active influence in the milk while nursing because when they were used to nurse mice which were susceptible for the development of breast cancer, a high incidence resulted (15).

C57 black females of only the fostered generation observed by others gave comparative results. Andervont (35) obtained an incidence of 10.3% in 58 mice of this strain when fostered by C3H females and van Gulik and Korteweg (16) an incidence of 13% (67 mice) following nursing by females of the dilute brown stock which had an incidence of 85% in virgin females. De Ome (36), in a preliminary report, found that 20.9% of the C57 black females directly fostered by females of the A strain had tumors. (In these experiments, by others, observations were not made on the incidence of tumors in the progeny of the fostered females.)

To determine the role of the susceptibility constitution in the etiology of

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chromosomes. The medical definition is quite different.

breast tumors in mice, reciprocal matings were made between representatives of the high cancerous A and the low cancerous B (C57 black) strains.

the incidence exceed 5% (the normal incidence observed for the mice of the A strain) (6).

The data for the breeding females of

TABLE 1

*Tumor incidences observed in inbred strains of fostered and unfostered mice and their hybrids*

| Stock | Nursed by: | No. | Cancer Incidence | Average Age in months | |
|---|---|---|---|---|---|
| | | | | Cancer | Non-cancer |
| | | | % | | |
| A ($F_{41}$ - $F_{61}$) | High Ca. ♀ | 527 | 96.8 | 9.6 | 10.9 |
| C57 blk. or B | Low Ca. ♀ | 568 | 0.5 | 21.4 | 20.8 |
| $ABF_1$ by A♀ | High Ca. ♀ | 141 | 95.0 | 11.2 | 12.4 |
| $BAF_1$ by A♀ | High Ca. ♀ | 149 | 88.6 | 11.7 | 17.9 |
| $ABF_2$ by A♀ | High Ca. ♀ | 300 | 76.3 | 13.2 | 18.0 |
| $BAF_2$ by A♀ | High Ca. ♀ | 124 | 64.5 | 14.9 | 21.3 |
| $ABF_3$ by A♀ | Ca. mothers | 285 | 68.8 | 12.1 | 18.5 |
| $ABF_3$ by A♀ | Non-Ca. mothers | 57 | 57.9 | 12.9 | 17.3 |
| $ABF_3$ by A♀ | Total | 342 | 67.0 | | |
| $BAF_3$ by A♀ | Ca. mothers | 229 | 72.9 | 12.4 | 18.5 |
| $BAF_3$ by A♀ | Non-Ca. mothers | 50 | 34.0 | 14.8 | 20.4 |
| $BAF_3$ by A♀ | Total | 279 | 65.9 | | |
| $ABF_1$ by B♀ | Low Ca. ♀ | 154 | 1.3 | 22.0 | 21.7 |
| $BAF_1$ by B♀ | Low Ca. ♀ | 148 | 1.4 | 12.5 | 21.7 |
| $ABF_2$ by B♀ | Low Ca. ♀ | 152 | 1.9 | 18.5 | 21.9 |
| $BAF_2$ by B♀ | Low Ca. ♀ | 358 | 0.8 | 19.8 | 21.4 |
| $ABF_3$ by B♀ | Low Ca. ♀ | 183 | 1.1 | 17.5 | 21.3 |
| $BAF_3$ by B♀ | Low Ca. ♀ | 228 | 0.9 | 19.0 | 21.1 |
| B by A♀ and progeny | High Ca. ♀ | 104 | 10.6 | 13.2 | 16.6 |
| A by B♀ and A by X♀—1st generation | Low Ca. ♀ | 127 | 7.9 | 11.2 | 17.7 |
| Progeny of Ca. fostered | Ca. mothers | 82 | 58.5 | 11.8 | 17.2 |
| Progeny of non-Ca. fostered | Non-Ca. mothers | 525 | 6.1 | 12.6 | 16.8 |
| A by X♀ = Ax stock | Low Ca. ♀ | 299 | 3.0 | 13.9 | 17.2 |
| AxT—from Ax stock | | 115 | 96.5 | 9.8 | 9.4 |
| Ax♀ x A♂—$F_1$ | Low Ca. ♀ | 107 | 0.0 | | 17.4 |
| Ax♀ x A♂—$F_2$ | Low Ca. ♀ | 152 | 0.7 | 11.5 | 17.8 |
| A♀ x Ax♂—$F_1$ | High Ca. ♀ | 117 | 94.0 | 9.1 | 8.1 |
| A♀ x Ax♂—$F_2$ | High Ca. ♀ | 133 | 95.5 | 9.5 | 8.6 |
| A♀ x Ax♂—$F_3$ | High Ca. ♀ | 149 | 96.6 | 8.8 | 9.6 |
| A♀ x Ax♂—$F_4$ | High Ca. ♀ | 124 | 98.4 | 9.3 | 8.1 |
| A♀ x Ax♂—$F_5$ | High Ca. ♀ | 77 | 93.5 | 9.6 | 10.4 |

When the mice of the two parental strains were maintained as virgins the incidences were 4.9% for the A females (6) and 0% for the mice of the B stock (24). The number of females of the first and second hybrid generations observed as virgins was 456 and in no group did

the various hybrid generations are given in Table 1. To designate the type of matings the maternal strain is given first: i.e., A♀ x B♂ = $ABF_1$ and B♀ x A♂ = $BAF_1$. To these symbols are added "by A♀" or "by B♀" which imply how the mice were nursed. Mice of the

second and third generations nursed their mothers of the first or second generation respectively. All the hybrids have died from tumors or other causes and the data are not complete.

Hybrids of the first generation which had maternal parents from the cancerous strain and nursed their maternal cancerous mothers gave a high incidence ($ABF_1$ by A ♀, 95%). If they were fostered by females of the strain having a low incidence, few of the mice developed tumors ($ABF_1$ by B ♀, 1.3%). When the mice had mothers from the low cancerous strain and nursed their mothers, the incidence was 1.4% ($BAF_1$ by B ♀); but if they were given to females of the cancerous stock the incidence increased to 88.6% ($BAF_1$ by A ♀).

The hybrids of the second generation descended from mothers which nursed cancerous females gave 76.3% ($ABF_2$ by A ♀) and 64.5% ($BAF_2$ by A ♀). The incidences were low for the groups of $F_2$ mice which nursed females of the low cancerous strain (1.9% for mice of the $ABF_2$ by B ♀ and 0.8% for females of the $BAF_2$ by B ♀ classes).

The two groups of $F_3$ hybrids expected to have some tumors, as they were descended from mice which nursed females of the cancerous strain, had incidences of 67.0% ($ABF_3$ by A ♀) and 65.9% ($BAF_3$ by A ♀). The reciprocal generations gave 1.1% ($ABF_3$ by B ♀) and 0.9% ($BAF_3$ by B ♀).

Over 2500 hybrid mice were studied.

If susceptibility for the development of breast cancer is transmitted as a genetic factor (or factors), two groups of $F_2$ maternal parents would be possible because of the segregation of the susceptibility factor in the mice of this generation —cancerous and non-cancerous mothers. Thus, the mice of the third generations may be tabulated according to the diagnosis of their $F_2$ mothers. (It should be noted that the males of the second generation might also be cancerous or non-cancerous as regards their susceptibility. Thus, some of the progeny of non-cancerous females would be expected to develop tumors if their fathers were genetically cancerous.)

The observations for the $ABF_3$ by A ♀ and the $BAF_3$ by A ♀ hybrids with cancerous mothers were 68.8% and 72.9%; when the mothers were non-cancerous the respective incidences were 57.9% and 34.0%.

If susceptibility for the development of tumors of the breast may be transmitted as a single Mendelian dominant, we would expect a 1+:1− ratio following the random mating of non-cancerous $F_2$ mothers to $F_2$ males. These males might be cancerous or non-cancerous as regards their genetic constitution. The combined observations for all the mice of the $F_3$ generations gave this ratio, when descended from females of the $F_2$ generation which were non-cancerous.

When tabulating the results it was noticed that the progeny of some of the non-cancerous females of the second generation had higher incidences of tumors when they were members of the third or any of the following litters than when they had been born in the first or second litters. The only exceptions to this statement for the hybrids were the observations made on animals of the $BAF_2$ by A ♀ mice and the animals of the $ABF_3$ by A ♀ generation having non-cancerous mothers.

This difference in incidence in the results for the $BAF_2$ by A ♀ hybrids of the 5th and 6th litters accounts for the lower incidence of tumors observed in mice of this group than that which was found in the $ABF_2$ by A ♀ animals. There was

no difference in the incidences for the mice of the first four litters.

The incidence of tumors in the $ABF_1$ by A ♀ hybrids was 95.0% and for the $BAF_1$ and A ♀ mice it was 88.6%. For the mice born in the third and following litters the respective incidences were 97.1% and 96.1%; the mice of the first two litters in these groups gave 93.1% and 84.7%. Sixty-six per cent of the mice of the $BAF_1$ by A ♀ group were born in either the first or the second litters and because of their low incidence resulted in the differences observed in the incidences for the mice of these groups.

As other data indicated that the quantity of milk given by mouth or obtained by nursing might change the incidence of tumors, these observations may demonstrate that the influence may be more concentrated in the milk after the females have had two litters.

To determine if foster-nursing might change in any way the so-called inherited susceptibility, a cross was made between representatives of the A cancerous strain and the line of fostered mice of the A strain which have a low incidence of breast tumors. This subline has been termed the Ax strain as all the mice were descended from one female of the A strain which had been nursed by a female of the CBA or X stock (32). The incidence of tumors in 292 breeding females of the Ax strain was 3%.

When the females of the line having a low incidence were mated to males of the cancerous strain, the incidences in the $F_1$ and $F_2$ mice were 0.0% and 0.7% in a total of 259 mice. The respective average ages of the non-cancerous mice were 17.4 and 17.8 months.

All the females of the reciprocal cross of the first three hybrid generations have died and in the 4th and 5th generations only litters have been tabulated in which the records are complete (all of the mice have died). In these generations the total number of animals observed was 600, of which 95.8% developed tumors of the mammary gland. The incidence for the animals of the second generation was 95.5% (133 mice). This material is now in press.[5]

## DISCUSSION

"Carcinoma can occur only in a mammary gland which has undergone a certain degree of development. The development of the mammary gland is dependent upon the estrogenic and pituitary hormones. But whether these stimulating factors play a direct role in the cancerization process, or only produce the anatomical development of the mammary gland sufficient to allow the cancer process to manifest itself is still undetermined"—from Lacassagne (37).

Van Gulik and Korteweg (38) observed differences in the susceptibility of spayed mice of various strains to follicular hormones and suggested that there may be a causal relation between the susceptibility of the genital organs to estrogenic hormones and the development of breast cancer. The data obtained by Bonser (39) and van Gulik and Korteweg (38) showed that the genital organs of the mice of strains having a high incidence of breast tumors were less susceptible to these hormones than were the animals of strains having a low incidence. The conclusion was reached that the individuals of the low cancerous strains produced the greatest amount of hormones under normal conditions.

Shimkin and Andervont (40) in a recent study found that although the

[5] "Foster nursing and genetic susceptibility for tumor of the breast in mice." *Cancer Research*, 1941, **1**: 793.

incidence of breast tumors might be reduced as the result of foster-nursing, there was no change in the resistance or susceptibility of the mice to estrone as far as the vaginal reaction was concerned. The differences in reaction are strain differences and thus not causally related to the formation of breast cancer.

The experiments of Loeb (41 and 42), Cori (43) and Murray (44–47) on castration demonstrated that the secretion of the estrogenic hormones might be considered as necessary for the formation of breast tumors in mice.

More recently Woolley, Fekete and Little (48–50) have noted in ovariectomized animals of a strain having a high incidence of breast tumors the nodular hyperplasia of the adrenal cortex and, in many cases, the growth of the mammary glands. Similar changes were noted in the adrenals of castrated males; one male developed two mammary tumors (50). Thus, the adrenal may simulate or replace ovarian activity in these experimental animals.

A new field for study was opened following Lacassagne's work on the induction of mammary tumors in female and male mice following the injection of large doses of estrogenic hormones (51). Reviews have been published by Gardner (52) and Loeb (53) of the numerous manuscripts which have resulted on this problem.

As it has been noted by various workers that it is more difficult to induce tumors in mice of strains having a low incidence of spontaneous carcinoma of the breast, Gardner (51) and others have concluded that this was probably because of intrinsic factors.

Approximately one per cent of the males of the C57 black strain which have been subjected to massive doses of estrogenic hormones have had induced carcinoma of the breast (54, 55, 56). Twombly (55) found, however, that if males of the C57 black strain were fostered by females of a high cancerous strain and later injected with estrogens, some of these fostered males would have induced tumors of the breast (9 of 27 males).

The studies made by the author (34, 57) showed that fostered mice of cancerous strains developed few tumors following the subcutaneous implantation of pellets of estradiol benzoate and estrone. Twenty-six females of the cancerous strains were treated and the incidence was 53.8%; 30 males of the same strains gave 23.3% cancer. The number of fostered mice of the same cancerous strains observed was 111 (62 females and 49 males) and not any developed tumors. Fostered mice of low cancerous strains were not studied.

Shimkin and Andervont (40) used control and fostered mice of strains having high and low incidences of spontaneous tumors of the mammary gland. Males of the cancerous C3H strain nursed by C3H females gave an incidence of 68.2% (22 mice) when injected with stilbestrol and 31 males fostered by females of the C57 black strain gave 3.2% cancer. The induced incidence in 34 females of the low C strain was 2.9% and the males were free from tumors. When fostered by females of the C3H stock the males of the C strain gave an incidence of 30.8% (13 mice) and the 20 females gave an incidence of 70.0%.

We concluded (34, 57) that the importance of the intrinsic or genetic susceptibility for the development of spontaneous tumors of the breast was not as significant for the induction of estrogenic tumors if the mice have been nursed by females of the cancerous strains. Shimkin and Andervont (40) stated that the work suggested that the hormonal stimu-

lus must also be relegated to a secondary position in the development of mammary carcinoma as Murray and Little (11) concluded that some extrachromosomal influence was ten times as important as the genetic constitution.

Differences in the structure of the mammary glands of virgin female mice of the cancerous dilute brown strain and the low cancerous C57 black strains were noted by van Gulik and Korteweg (16). When mice of the cancerous strain were fostered by females of the C57 black stock, these fostered mice had glands where the primary ducts were of the normal dilute brown type but the gland-tree possessed characteristics of the low cancerous strain. The primary duct of the glands of the mice of the C57 black stock fostered by females of the dilute brown strain were normal for mice of the low cancerous mice. They described the structure of the gland-tree of these fostered mice as follows: "On the whole the architecture of the gland-tree is of the C57-type,[6] but at the same time some ducts spring from the ducts, which, in architecture are identical with that of the dilute brown[6]-type. It looks as if here ducts of the dilute brown-type had been inoculated on a gland-tree of the C57-type."

"In the fostered $F_1$-hybrids the primary duct present the type belonging to the mother. In other types of hybrids the gland-tree is mainly of the C57-type, but in the C57-females fostered by the dilute brown-females we again find a similar "inoculating" of milk ducts of the dilute brown-type on a gland-tree of the C57-type."

"Both the kind of milk and the nature of the plasma- and uterusfactor consequently influence the architecture of the gland-tree. . . . The influence of the plasma and uterus, or one of them, must be responsible for the architecture of the primary duct." There was assumed to be a relationship between the anatomical architecture of the mammary gland and the degree of the disposition for cancer of this organ.

A discussion of the relative importance of the genetic constitution, estrogenic stimulation and the influence in the milk of cancerous females in the genesis of mammary tumors may be of interest.

Murray and Little (11) have concluded that "the tendency to have mammary cancer is not mendelian in nature" and that the extrachromosomal influence was ten times as powerful as any chromosomal factor. In their experiment crosses were made between mice of the cancerous dilute brown and the low cancerous C57 black strains. The incidences in virgin females of the two parental stocks were 50.9% and 0%. The mice of the first and second generations having maternal parents from the cancerous strain gave incidences of 38.8% and 35.5% respectively and the incidences for the hybrids made in the reciprocal manner were 6.1% and 6.0%. While the mice receiving the maternal or extrachromosomal influence from the females of the cancerous strain gave higher incidences, further studies are needed to evaluate the role of the genetic susceptibility in the development of these tumors.

The incidence of breast tumors among the breeding females of the C57 black strain was 0.5%, as observed by Little, Murray and Cloudman (24). Mice fostered by females of cancerous strains and used as breeders gave incidences of 11%–13% (4, 15). The incidence observed for fostered females of this strain kept as virgins was 13% (16).

Breast tumors developed in over 95%

[6] Changes made in the symbols to correspond with those used at this laboratory.

of the breeding females of the A strain and in 8% of the females fostered by mothers of the C57 black strain. Some of these fostered females did obtain the active influence (extrachromosomal influence) in the milk from their maternal or cancerous parents before they were removed, as has been demonstrated by breeding tests. Fostered mice which were cancerous had cancerous progeny and the incidence was dependent upon the amount of the influence they obtained; fostered mice which were non-cancerous had progeny with a low incidence and, with only one exception, cancerous progeny of these females in turn had offspring with a low incidence. If the progeny of these fostered mice which were non-cancerous are nursed by females of the cancerous line, they will again have a high incidence of tumors.

We must assume that the mice of the inbred C57 black strain are homozygous. This being the case, the fostered mice should have an incidence of breast tumors approaching that observed in females of cancerous strains if the genetic constitution of the individual has little bearing on the development of mammary carcinoma. Why some of the fostered mice of the C57 strain should become cancerous cannot be explained at this time. Their progeny did not show a high incidence, while non-cancerous females of a cancerous strain have cancerous progeny (25, 18).

The hybrids of the first generation of the cross between the cancerous A and the low cancerous C57 black strains when nursed by females of the low strain gave low incidences, while the hybrids nursed by females of the cancerous strain had high incidence, regardless of their maternal parents. The mice of the second generations nursed by cancerous mothers gave incidences in accord with the mendelian theory that susceptibility to inherited breast cancer might be transmitted as a single dominant factor. This susceptibility may be transmitted by the males as well as the females of the cancerous strain. This theory is being studied in other experiments.

In another work a cross was made between sub-lines of the same strain (A). One line had a high incidence of breast tumors as the young nursed their cancerous mothers, while the females of the second sub-line had a low incidence as the result of foster-nursing. This incidence was only slightly higher than was observed in mice of the C57 black stock. Hybrids which had maternal parents from the cancerous line of the A stock have been continued for seven generations and data are available for the first five generations. There has been no change in the incidence of tumors; that is, there is no reduction in the incidence of tumors as compared with the mice of the cancerous strain. Thus, foster-nursing has not changed the inherited susceptibility of the mice of this particular strain to have carcinoma of the breast, as demonstrated by the incidences in the mice of the second and succeeding hybrid generations. Also, no reduction in the incidence of tumors was observed in the mice of the second generation, as was noted when the mice of the cancerous strain were mated to mice of the C57 black strain, a strain considered to be resistant or non-susceptible for the development of inherited tumors of the mammary gland.

Unless we assume that the genetic or inherited constitution of the host is of approximately the same importance as the influence in the milk (extrachromosomal influence) of females of cancerous strains, we are unable to explain why some strains have a high incidence and others a low incidence of mammary can-

cer. If we state that, because the mice of the C57 black strain have a normal incidence of 1% and the fostered females of this strain an incidence of 10%, the extrachromosomal influence is 10 times as important as any chromosomal factor, we still must account for a high incidence (80%) in females of the first generation which were nursed by these fostered females of the C57 black strain (15).

These results may be explained on another basis. Investigators should realize that there may be more than one type of carcinoma of the breast in mice and this difference may only be recognized by observing the incidence in the progeny of the cancerous females. Mice which have the so-called non-inherited type will not have many cancerous progeny and these mice with tumors are usually from strains which have a low cancer incidence. In these strains which are non-susceptible for the development of tumors of the breast we should only expect to have a line arise with a high incidence following mutational changes in the genetic susceptibility of the individuals. This is possible, however.

The etiology of such growths must differ in some respect from the genesis of the inherited type of breast tumors. Do they arise by a process analogous to somatic mutations?

For the development of the inherited type of breast cancer in mice there generally must be present and active the influence obtained in the milk of cancerous mothers, an inherited susceptibility and a sufficient amount of the estrogenic hormones to stimulate the development of the mammary glands. The nature of the milk-influence has not been determined but preliminary results suggest that it might be defined as a virus (58). This influence may arise *de novo* or by changes in the inactive influence (59). It may be present in other organs, as the spleen and thymus, and the active influence may be transferred by the inoculation of grafts or the feeding of extracts of these and other organs containing the influence (60, 34). The influence is not present or has been destroyed in the liver (34). Breast tumors which develop spontaneously also have the active influence (60).

Several workers (55, 34, 57 and 40) have obtained results which may be interpreted as showing that the inherited susceptibility for the genesis of spontaneous tumors may play a less important role in the induction of breast tumors by estrogenic hormones if the milk-influence is active than in the etiology of spontaneous growths. The relative importance of the genetic susceptibility for the etiology of spontaneous tumors of the breast and the influence in the milk (extrachromosomal influence) may be said to be about equal for the inherited type of breast cancer in mice from the data obtained in these experiments. For the development of the non-inherited breast tumors in mice one or more of the "influences" is generally inactive.

Little can be said at this time concerning the application of this theory for mice to the problem of breast cancer in humans. Experiments have been started but the final results will not be available for some time. Negative results will not necessarily denote that there is not an "influence" in the milk of humans, as it may be specific only for humans and not for mice. It may be necessary to obtain accurate records on the incidence of breast tumors in humans who were breast-fed and bottle-fed from *birth* before the result will be apparent. This may take at least fifty years.

The only suggestion which might be

made is that the mothers who have breast cancer in their families should not nurse their daughters. As it has been observed that the fostering of mice 24 hours after birth has little or no effect on the incidence of tumors, the time-element is of great importance. Thus, breast-feeding in humans having any breast cancer in their ancestry should not be permitted for a few days or the duration of hospitalization—it should not be permitted at all.

## SUMMARY

In mice there are at least two types of tumors of the breast—inherited and non-inherited.

For the development of the inherited type of breast cancer the animals must have (a) an active influence in the milk which is transferred to the young while nursing, (b) an inherited susceptibility, and (c) the growth of the mammary glands resulting from hormonal stimulation which will permit the cancerous change. Non-inherited tumors generally result when one or more of these "influences" are inactive.

In strains of mice having a high cancer incidence, both the non-cancerous and cancerous females have progeny with a high incidence; in a low strain the incidence is generally no higher for the progeny of cancerous than non-cancerous mothers.

By foster-nursing the progeny of females of cancerous stocks to females from low cancerous strains, it is possible to reduce the incidence of cancer in the fostered mice and their progeny.[7] Foster-nursing delayed for 24 hours or longer after birth had little effect on the incidence of tumors. Mice of low cancerous strains nursed by females of cancerous strains have a higher incidence of tumors than do the controls, but this incidence does not compare with that observed in mice of strains having a high incidence. If the fostered mice of low cancerous strains are used to nurse susceptible animals, a high incidence will result.

The milk-influence is also present and active in the spleen, thymus, lactating mammary tissue and breast tumors obtained from mice of cancerous strains. The amount of the material fed or injected into susceptible mice will have some bearing on the incidence of tumors and the average age at which the mice will develop tumors.

The influence in the milk is active during the entire lactation period. It may be more concentrated in older mice than in younger animals.

The inherited susceptibility for the development of spontaneous tumors of the breast is a dominant character and the data are in accord with the genetic theory for a single factor. For the genesis of the inherited type of breast tumors in mice, the inherited susceptibility is about as important as the active milk- or extrachromosomal influence. Foster-nursing does not change the inherited susceptibility of an individual for the development of breast tumors.

The active influence in the milk may be necessary for the induction of tumors by estrogenic hormones and, when this is obtained by nursing, tumors may be induced in mice of strains considered to be non-susceptible for the development of spontaneous tumors of the breast.

It is suggested that mothers having any breast tumors in their family should not be permitted to nurse their daughters from *birth*.

[7] A high incidence may be obtained by having the mice nursed by females of the cancerous strain.

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# Observations on Nutrition in France*†

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WAR time conditions which brought the Rockefeller Foundation's regular work in Europe to a halt led to the organization in July of 1940 of a Health Commission under the direction of the Foundation's International Health Division. The purpose of this Commission was to assist in public health work in cooperation with the public health agencies of the various governments.

One of the activities of this Commission, of which I was a member, was to assist in the reorganization of the French Public Health Service and one of the features of that reorganization was the introduction and development of a Section of Nutrition. Thus, an opportunity was presented for the first time, I believe, to establish a service in nutrition in the modern sense as a regular part of a public health department.

Although the interest in nutrition and nutrition problems was heightened by the shortage of food and the danger and expectation of severe and extensive malnutrition, the Section of Nutrition was not conceived as an emergency or temporary organization. Rather it is intended to be a permanent part of the public health service, and one which is expected to continue its services in the public health aspects of nutrition after the present emergency is over.

The original plan had been to assist in the reorganization of the national public health department in Paris and to establish a section of nutrition, with the other sections, in a National Institute of Hygiene. For various reasons this was impossible to the extent originally planned. Therefore, assistance was given in establishing a regional health department in the Marseille area. This served not only as an active public health unit but as a demonstration and training center. A section of nutrition was, however, established in Paris to serve that region.

One of the functions of a section of nutrition in a public health department is to conduct surveys of the nutrition of the population, both the general population and special groups. The first work of the Section on Nutrition in the Marseille region was to make a survey and assessment of the nutrition of the general population and of certain special groups such as school children.

Before proceeding with a discussion of these studies, however, it will be helpful to consider certain aspects of the situation with respect to food supplies and the control of food supplies in France during the period under consideration. This will serve as a background against which the actual studies of the nutrition of the people will possess a clearer significance.

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† The studies and observations on which this paper is based were conducted with the support and under the auspices of the Rockefeller Foundation Health Commission in cooperation with the Secretariat General à la Famille et à la Santé de France.

As Brandt has pointed out in "Foreign Affairs,"[1] the conservation of food supplies and procedures to increase food production were among the earliest actions taken by the nations of Europe, as a result of the war. They acted to anticipate, and if possible to prevent, a food shortage rather than to combat or relieve a famine already developed. There is reason to believe that stocks of food in France were adequate up to the time of the defeat in June of 1940. The blockade did not become effective for some time later. Therefore, except for local and temporary shortages due to confusion in transport and supply during the short campaign preceding the defeat, it is unlikely that significant shortages existed until German requisitions and purchases had been begun, until the blockade interfered with imports, and until chronic, wide-spread difficulties in transportation and distribution developed. This means that rationing and other measures designed to conserve food and increase production were begun before, or as soon as interference with normal food supply developed. Translated into terms of nutrition this means that the French acted to prevent undernutrition and nutritional deficiency disease before they occurred and while the population was still in a presumably good state of nutrition. Furthermore, it may be stated that this effort by the French was based on the newer knowledge and concept of nutrition and nutritional deficiencies and aimed at the prevention of much milder and earlier deficiencies than such classic diseases as scurvy and pellagra. Thus, it constitutes one of the first efforts in mass prevention or prophylaxis of the subclinical or latent types of malnutrition.

Just what stocks of food remained in France after German requisition and purchases and other losses occurred is uncertain, but the means which were adopted to conserve those supplies are well known, especially to those who were subjected to them. One of the first measures applied was rationing. Considerable confusion and misunderstanding exists in this country about this rationing. Rationing does not necessarily mean a significant food shortage; as in this case, it is often instituted before a food shortage to prevent it and to bring about a more even and fair distribution of food. Some neutral countries in Europe adopted rationing early in the war and Germany rationed certain items before the war to lay up a surplus. It is true that many foods in France were rationed and if the food consumption had been limited to rationed foods the diet would have been very restricted. Meat, including horse meat in the spring of 1941, was rationed in unoccupied France to about two ounces a day. Milk was rationed and in many parts of France was officially available only to children, nursing and pregnant women and old persons. Cheese, except cottage cheese, was rationed and scarce in most places, the ration being about seven ounces a month. Bread was limited to 270 to 300 grams a day on the average and other cereals, as well as certain dried beans and peas, were rationed. Cane sugar was even more sharply limited and potatoes, besides being rationed were very scarce and often non-obtainable in many parts of France. Fats were rationed to an average of about fifteen grams per day. But, many animal products, such as goat meat, certain viscera, eggs, fowl and game, fish and other sea food and fat-free cottage cheese were not rationed. Neither were fresh vegetables, fruits or nuts and there was a very good unrationed grape sugar.

[1] Brandt, Karl: How Europe is Fighting Famine, Foreign Affairs, July, 1941.

Furthermore, special allowances were made for special groups such as children, old people, those doing hard physical labor, and pregnant and nursing women.

It is also very difficult to state the supplies of rationed food available to the consumer except at a given moment, in a given place and for a given class. The value of the tickets of the food cards varied from time to time. Supplements such as chocolate, special allotments of peas or beans and other foods were issued at irregular periods. Foods were withdrawn or again made available, their status changing from week to week or month to month. There also were differences depending on whether one ate at home or at restaurants.

However, rationing was not the only limiting factor in the consumption of foods. Rationing is the sort of administrative procedure which may differ greatly in intent and in actual practice. Price, as always, was a very potent factor as was the availability of a food or its supply. Both price and supply were greatly affected by numerous laws and regulations, many of which were designed for the dual purpose of conserving the supply of a food and keeping the price at a reasonable level. Although the main regulations were issued by the Central Government at Vichy many local regulations were permitted which contributed to regional variations in supplies, either shortages or excesses. The laws and regulations varied from simple price fixing to complicated regulations governing the sale and movement of produce from farm to table, the date of the digging of potatoes, the number of hens from which one might keep the eggs, regulations governing the prices and operation of restaurants and other laws of a restrictive and regulatory type.

The general effect of all these measures on the conservation of food supplies or the production of food is difficult to determine because of lack of information as to the original and subsequent stocks of food, the fate of imports and losses other than by consumption. In many cases the regulations had an adverse effect, tending to discourage production and to drive food from the open market to the illegal or "black market" so that foods, theoretically and officially available at reasonable official prices, could not be found on the open market. They also tended to cause unevenness in the distribution of food, regulations in one area causing food to be shipped from such areas to others. These irregularities in food distribution were exaggerated by a natural regional unevenness in food production and by difficulties in transportation. Another unfavorable result was the queues at stores and shops and the necessity for standing in line for hours in all weathers to obtain needed supplies, a task which sometimes went unrewarded because the supplies gave out before all were served. In addition to a direct effect on food supplies such conditions and practices had an unfavorable effect on morale. Finally, seasonal variation was responsible for a considerable unevenness in food supplies, an unevenness which was greater because of difficulties in storage and preservation.

The net effect as far as actual food consumption was concerned can be summed up as follows. First, between the rationed and unrationed food a fair dietary was permitted provided the individual could afford to buy the food and supplies of it were available. Second, for the majority of the people this was possible, but, because of some scarcity on the open market and an increase in the price of some items the number of those unable to purchase or obtain sufficient

and proper food, increased beyond that normally present in the country and extended into higher income brackets. Third, such a diet was in general at maintenance levels with slight shortages in some factors at different times and in different places and it often failed to provide in amount, character, preparation and selection, a diet to which the people were accustomed or which was to their liking. This interference with national and local food habits and customs probably had significant influence on the occurrence of very mild or early deficiencies of certain nutritive factors. As will be seen later, this general appraisal of the level of food consumption agrees fairly well with the findings from the survey of nutrition.

Relatively little was done by the French in the way of direct relief, partly because of the lack of pressing need such as would have occurred had extensive malnutrition existed and partly because of the extensive use of supplements or doles of money, which were provided for many classes of the population and adjusted somewhat to the cost of living. There was, however, some distribution of vitamins, particularly A and C to children and adolescents, and a limited direct relief in certain cases. American agencies, Society of Friends, the Red Cross, and others distributed certain foods and vitamins to special groups and made an important and significant contribution. Part of this work, especially that carried on by the Society of Friends was done in internment camps of various sorts, a special group which will not be considered here.

Let us turn now to the survey of the nutrition of the population which was made during the late winter and spring of 1941. The principal survey was made on a sample of the general population of the metropolitan Marseille area. The selection of subjects was made on a family basis, as far as possible by random sampling and in proportion to the density population of the various parts of the area. The subjects were from all classes and economic levels and represent existing distribution with respect to age, sex, and similar factors with one exception. There was a smaller than normal proportion of young and middle aged adult males (fathers and heads of families) partly because of absence from their homes.

Additional surveys were made of special groups, particularly of school children at certain ages. The latter were among the subjects of a special study of growth and development under the special direction of Dr. Harold C. Stuart of Boston, one of the members of the Commission. Additional surveys were conducted in the Paris area by the Section on Nutrition in that region. These were under the direction of Dr. H. Gounelle and for the most part consisted of surveys of the nutrition with respect to separate factors such as vitamin A, and in special groups. However, a survey of the general population was begun there in the late spring.

The survey of the general population in the Marseille region consisted of a record of the diet, a medical history, a complete physical examination and laboratory tests. The study of the diet consisted of a family inventory and purchase record for one week, with a nonconsecutive three day record of food intake for each individual in the family. This was made by trained field workers under the supervision of the directors of the Section of Nutrition. These field workers not only directed and closely supervised the work of the diet study but when necessary actually participated in keeping the diet records. In addition to

the dietary record certain socio-economic data were also gotten.

The medical history and physical examination were done at one of the hospitals by physicians with special experience in nutrition. Both history and physical examination were of the character and completeness of the usual diagnostic examination with special emphasis on the symptoms and signs of deficiency disease, particularly the mild or early stages. For the purpose of making uniform diagnosis by the history and physical examination, analysis sheets were prepared on which were listed the symptoms and signs of the various deficiencies. These were divided into two groups, those suggestive of a given deficiency and those which are diagnostic. Obviously the suggestive signs and symptoms are relatively non-specific and indicate a possible deficiency only, although the probability of correctness varies with sign and with the deficiency, some signs and symptoms being more certain than others. When the examiner finished with his history and examination the symptoms and signs he had found were checked on the analysis sheet and the diagnosis made accordingly. By this method diagnoses by the various examiners were made more quickly and uniformly. Obviously, the value of the physician as an examiner lies in his judgment of the signs and symptoms. Dermatitis due to scabies can be distinguished from that possibly due to pellagra.

The special laboratory tests were made at the same time and included a test of dark adaptation for vitamin A deficiency, an examination of the eye with the slit lamp, a determination of the vitamins A and C in the blood, the serum proteins, the phosphorus and phosphatase, red blood cell counts and hemoglobin determinations. An x-ray was made of the arm and leg in children and of the arm in adults.

The tests of dark adaptation were made with the apparatus and technique of Chevallier. The concentration of vitamins A and C in the blood were determined by the spectrophotometric method of Chevallier, the serum proteins by the microkjeldahl and the phosphorus and phosphatase of the blood by Bodansky's method. Red cell counts were made in the usual manner and hemoglobin determinations were done by electrocolorimetry. X-rays were made under constant standard conditions in the X-ray department of the Hospital of the Conception, and a densitometer was used for the study of bone density and demineralization.

Children included in the study of growth and development were subjected to the same procedures with a few exceptions and certain additions. In this group there were additional anthropometric measurements and special x-ray studies. Unless they were part of the general population group a study of their diet was not made by the family and individual records described above but a special questionnaire was used instead. For children below eleven in the general population group this special questionnaire was added and if they were included in the study of growth and development they were given the special anthropometric and x-ray examinations.

The survey of the general population in the Paris area was conducted in a manner similar to that in Marseille but in the special studies the examinations were usually limited to a single test for the particular nutritive factor being studied and the diet study was of a very limited kind.

Several hundred subjects were examined in this way in the survey of the general population of Marseille and some

hundreds more in special groups. No attempt will be made to give a detailed description of the results which have not yet been fully studied. I have made a selection and some preliminary analyses of the data, however, which I think will give some general idea of the state of nutrition with respect to certain nutritive factors. It must be emphasized that such findings are in every way partial and preliminary and must not be taken as final. Subsequent analyses may alter some of the findings and conclusions. The data have been selected for the most part from the study of the general population in Marseille.

Analyses of the diet records of the general population indicate a calory intake at about maintenance levels. It is likely that the average will be found to be somewhat close to 2000 calories daily. Too much importance should not be attached to this value, of course, because the individual intakes have not been compared to individual requirements and a small number of very low or very high diets may distort the picture. Nevertheless these data agree fairly well with the findings of the physical examinations. The intake of animal protein was rather low. A more significant shortage was found in the intake of vitamins A and C and the analyses indicate a shortage of riboflavin also. The intake of thiamin was apparently not significantly reduced, probably because the bread which played a very important part in the dietary was made with high extraction flour. The wheat flour was 90 percent extraction and for bread only 85 percent of the flour was wheat flour, the remainder coming from rye, maize, barley, and peas or beans. In considering the food consumption it may be noted that unusually severe cold weather and a serious lack of heat may have raised requirements and made supplies relatively less sufficient.

The history and physical examination revealed little fully developed, outspoken nutritional disease except rickets. A few suggestive instances and a very few, clear cut cases of other deficiency disease were encountered but they were uncommon. In contrast to the relatively few findings on examination the laboratory tests indicate a rather widespread though mild deficiency of several factors. The following tables show the results of the history and physical examination and the laboratory tests for several of the nutritive factors. The figures are given as percentages and should not be taken as complete or final. In these tables the subjects from various economic levels have been grouped together so that the values represent those for the entire group. Deficiencies were always most numerous in the low income group but in the case of some factors the deficiency was nearly as frequent in the middle income group. Because of the significance of age the subjects have been divided into age groups.

TABLE 1

*Deficiency of calories*

| Ages | History | Physical Examination |
|---|---|---|
| | *percent* | *percent* |
| 0–2 | 10 | 24 |
| 2–12 | 22 | 16 |
| 12–19 | 21 | 7 |
| 19+ | 39 | 21 |

Table 1 gives the results in the case of calories. The histories represent the subjects' statements regarding food consumption and weight loss while the examination gives the physician's estimate but not an exact result based on weight and height tables. Except in the 0–2

year group a deficiency of calories thus determined was considerably less frequent on examination than by history. The infants, however, were judged deficient more often by the doctor than by the parents. Several factors are probably concerned here, among them the effect of mass suggestion which may have caused adults to think themselves in poorer condition than they were, and a greater or less degree of excess body weight in the older age groups which would allow for some loss of weight without bringing the subject below normal. Such possibilities are supported by a comparison of actual weights with values predicted from height, sex, and age. A preliminary analysis of this sort fails to reveal any striking degree of weight loss on the basis of predicted values. This is probably less true in the younger age groups.

TABLE 2

*Protein deficiency*

| Ages | History | Physical Examination | Serum Albumin Below Four Grams Percent |
|---|---|---|---|
| | *percent* | *percent* | *percent* |
| 0–2 | 0 | 0 | 0 |
| 2–12 | 0 | 0 | 0 |
| 12–19 | 0 | 0 | 0 |
| 19+ | 0.8 | 0 | 3 |

In contrast to calories very few subjects had symptoms suggesting a deficiency of protein and no evidence of such was found on examination although the diet study indicated some shortage (Table 2). This discrepancy can be explained by the fact that the early or slight effects of protein deficiency such as delayed growth are impossible to diagnose and other pathological changes due to protein deficiency, such as hypoproteinemia and nutritional edema, require a long time to develop. The failure of such protein shortage, as may have occurred, to cause detectable changes is shown by the results of the serum protein determinations. Only a very small number, all in the adult group, showed a hypoalbuminemia. This number probably would be encountered in the examination of any population of this size. Because of its dependence on calory intake as well as protein, and probably on other nutritional factors as well, the concentration of serum albumin may be a rather reliable guide as to general nutrition and the length of time that is necessary for hypoproteinemia and nutritional edema to develop in persons initially well nourished makes it a rather good index of their prior state of nutrition.

The results in respect to vitamin A are shown in Table 3. Diet studies indicated a shortage of this vitamin and that indication is supported by the examination and laboratory tests. It is seen that the incidence determined by the history is much lower than by physical examination except in the infants. This is probably because changes in the skin in adults make evidence of the deficiency more easy to obtain and more frequent on examination. It must be emphasized, however, that all of the diagnoses by physical examination were of possible cases only and no frank instances of vitamin A deficiency such as xerophthalmia or typical dermatoses were observed.

There is a considerable difference in the apparent incidence of the deficiency as indicated by the adaptometer tests and the blood vitamin A values. The results by adaptometry more nearly approach these by physical examination, but the former shows a steady increase in incidence with age. The incidence according to the blood levels of vitamin A is very high at all ages. The reliability and significance of both tests is at present uncertain and the results cannot be ac-

cepted unqualifiedly as a valid index of vitamin A deficiency. However, it may be pointed out that it is not necessary that the two tests indicate an incidence of the same degree. They may detect deficiency at different levels and the amount of the vitamin in the blood may fall before abnormalities appear in adaptation or on physical examination. The fact that a very low value for the concentration of vitamin A in the blood was used to separate normal from abnormal

TABLE 3

*Deficiency of vitamin A*

| Ages | History | Physical Examination | Adaptometer | Blood Vitamin A |
|---|---|---|---|---|
| | *percent* | *percent* | *percent* | *percent* |
| 0–2 | 10 | 6 | | 80 |
| 2–12 | 10 | 25 | 14 | 69 |
| 12–19 | 10 | 35 | 35 | 82 |
| 19+ | 15 | 19 | 47 | 70 |

TABLE 4

*Deficiency of vitamin $B_1$*

| Ages | History | Physical Examination |
|---|---|---|
| | *percent* | *percent* |
| 0–2 | 2 | 6 |
| 2–12 | 21 | 0 |
| 12–19 | 14 | 0 |
| 19+ | 29 | 1 |

in these tables and that most of the values in the group classed as deficient were "zero" probably makes the blood vitamin A findings significant.

No laboratory test was employed for vitamin $B_1$ deficiency but Table 4 is included to indicate the great differences between the incidence of this deficiency by history and examination. The difference is undoubtedly due to the fact that the *symptoms* of mild $B_1$ deficiency such as fatiguability, anorexia, vague neuritic pains, et cetera, are highly non-specific and are likely to be found in many subjects whether deficient or not. Even those diagnosed on examination represent possible cases only. It is unfortunate that such laboratory tests as are suitable could not be employed in this study. Certain neurocirculatory disorders, particularly of the type of chilblains, were very common and were attributed by some French workers to thiamin deficiency. Laboratory tests would have been helpful in investigating this possibility.

Table 5 gives the results in the case of riboflavin. Most of the cases included under "physical examination and slit lamp" showed only vascularization of the cornea and were detected only by the slit

TABLE 5

*Deficiency of riboflavin*

| Ages | History | Physical Examination and Slit Lamp |
|---|---|---|
| | *percent* | *percent* |
| 0–2 | 0 | 0 |
| 2–12 | 2 | 24 |
| 12–19 | 0 | 29 |
| 19+ | 3 | 36 |

lamp. Subjects with other lesions such as cheilosis and glossitis were few. Although it is probable that not all cases of vascularization of the cornea of this type are due to riboflavin deficiency most of them probably are and the results probably are a reliable indication of a rather high incidence of mild riboflavin deficiency. One curious finding was the absence of photophobia as revealed by the results of the history. This probably explains the low incidence on history compared to the large number found with the slit lamp, photophobia being about the only noteworthy symptom of early deficiency. Its absence in these cases is unexplained, it usually being a common symptom in even mild deficiency.

A possible nicotinic acid deficiency was diagnosed by the history in only ten subjects in the general survey while the physical examination detected only two possible cases. All were above two years of age and it should be stressed that they were possible deficiencies only. No frank cases of pellagra were seen. Unfortunately, suitable laboratory tests for a deficiency of this substance were not available.

In Table 6, summarizing the findings with vitamin C, we find again a low incidence according to physical examination and a high incidence according to the concentration of ascorbic acid (vitamin C) in the blood. It should be said that

TABLE 6

*Deficiency of vitamin C*

| Ages | History | Physical Examination | Blood Vitamin C | X-ray |
|---|---|---|---|---|
| | *percent* | *percent* | *percent* | *percent* |
| 0–2 | 6 | 2 | 80 | 0 |
| 2–12 | 0 | 4 | 57 | 0 |
| 12–19 | 3 | 3 | 67 | 0 |
| 19+ | 0.8 | 5 | 60 | 0 |

the level of concentration of ascorbic acid in the blood selected to separate abnormal from normal was very low, namely sigma, an amount too small to record quantitatively. This increases the significance of the test. Yet there was little or no actual scurvy, either by history, physical examination, or by x-ray, which revealed no cases. All the cases diagnosed by history or physical examination were possible cases only. Thus the test revealed a significant number of cases of vitamin C deficiency *before* the more advanced changes constituting scurvy had taken place. It is worth noting that vitamin C was one of the factors found deficient in the diet study.

As would be expected the incidence of vitamin D deficiency (essentially rickets) was much greater under two years than after that age, especially as diagnosed by the x-ray, phosphorus and phosphatase values (Table 7). The considerable number of cases after two years of age found by physical examination is probably accounted for by the deformities of old inactive rickets in the later years. The results of the study of the phosphorus and phosphatase levels in the blood have not been analysed but they seem consistent

TABLE 7

*Deficiency of vitamin D*

| Ages | History | Physical Examination | X-ray |
|---|---|---|---|
| | *percent* | *percent* | *percent* |
| 0–2 | 16 | 55 | 41 |
| 2–12 | 10 | 26 | 1 |
| 12–19 | 0 | 0 | 0 |
| 19+ | 0 | 0 | 0 |

TABLE 8

*Anemia*

| Ages | Physical Examination | Red Cells Below Four Million |
|---|---|---|
| | *percent* | *percent* |
| 0–2 | 10 | 22 |
| 2–12 | 2 | 18 |
| 12–19 | 0 | 3 |
| 19+ | 4 | 17 |

with the results of the other examinations. The high incidence in infants is interesting in view of the general French belief that rickets was uncommon in that area. It is probable, of course, that this deficiency had little to do with the current food shortages.

The rather considerable incidence of an anemia as revealed by the red cell count in the younger children and in the adult age periods (Table 8) is probably related to demands of growth and the influence of females in the adult group, respec-

tively. The reason for the small percentage in the age period 12 to 19 is unexplained as yet but may appear when more complete analysis of the data is made. It is probable, of course, that several factors other than a deficiency of iron in the diet were responsible for these anemias and it is also highly improbable that the anemias were to any great extent a result of the current deficiencies.

The results of the surveys conducted in the Paris area are not yet available in final form. Preliminary study of the results indicates that the deficiencies of certain nutritive factors such as vitamin A and C in special groups such as school children, inmates of institutions and similar groups, were about as frequent and of the same severity as in Marseille. No results are available as yet from the survey of the general population in Paris.

The findings of the special study of growth and development of children will be reported in full elsewhere by Dr. Stuart. Very briefly, the children included in this study showed a short stature compared with American standards or even with some French standards. They were also lighter in weight but weight for height was about normal. X-ray studies showed them to be considerably retarded in the pattern of osseous development according to our standards and the pattern was not only immature but very irregular, a feature usually associated with faulty nutrition or illness. X-ray also revealed evidences of faulty bone formation such as might be related to nutrition. It is probable, however, that none of the above changes were due solely or perhaps in any large measure to current difficulties in diet.

It is seen that the findings by the history, physical examination and laboratory tests are in general accord with the conclusions reached from a consideration of the food supplies. They appear to disclose the existence of a considerable amount of very mild or early deficiency in several nutritional factors but particularly of vitamins A and C, and riboflavin. The problem arises, however, as to how much these mild deficiencies were the result of current restrictions of food and how much they may have been a characteristic of the population before the present difficulties in food supply occurred. It is well known that certain classes of a population, but particularly the low economic groups, of any country will show, according to present day standards, a considerable incidence of mild dietary deficiencies if they are sought for by tests which will disclose these mild or latent forms of disease. It is probable that some at least of the deficiency which I have described as found by us in France was endemic and would have been discovered by the right sort of examination before the present difficulties occurred. But, there is reason to believe that these deficiencies were increased as the result of the present food shortages. This is suggested by the number of cases as well as by the finding of the deficiencies at the higher socio-economic levels in which some mild deficiencies may ordinarily be found but not to the same extent as disclosed by this survey.

In closing this account of observations on food and nutrition in France it should be emphasized that what has been said applies to the period of the study only, namely, from February to mid-June of 1941. Also that because of geographic variations the major findings apply strictly to the Marseille area only, though there is good reason to believe that they are fairly representative of the entire unoccupied area and much of the occupied area as well. What the situation will be in the future depends entirely on circum-

stances, the most important of which is the disposition of this season's harvest and food supplies. It is very possible that if the present dietary continues over a longer period the slight deficiencies which have been detected will begin to produce, by a cumulative action, more severe deficiency disease. It is also possible that some improvement in the food supply may relieve these deficiencies to a greater or less degree. Should even slight shortages continue they will have an important effect on children at least. In them even slight deficiencies continued over any but the shortest period will affect unfavorably the growth and development. The Section of Nutrition in the public health service at Marseille is continuing its functions and it is intended to conduct additional surveys during the coming year. With the original survey as a base line these successive resurveys will plot the course and effect of possible food deficiencies in a more complete manner than in the past.

# William Hunter Lecturing on Obstetrics and Infant Care

*By* EDWARD A. SCHUMANN, M.D.

BRITISH obstetricians of the 18th Century had reached a high standard of technical and scientific attainment. Smellie was at the height of his powers. White of Manchester had published his advanced views on puerperal sepsis. Sir Fielding Ould had exalted obstetrics in Ireland and invented episiotomy. Thomas Denman had developed the principle of induction of premature labor in the management of delivery in women with contracted pelves and William Hunter published his monumental and enduring work "The Anatomy of the Gravid Uterus."

Among this group of pioneers in the subject of midwifery, Hunter was by far the most important teacher and his series of lectures, while covering the entire medical curriculum, included a detailed and advanced course on obstetrics.

"A good description of his lectures is obtained from the notes of various students who attended them; from which we learn that in 1773 the Course began on 20 January, and lectures appear to have been delivered daily except Sundays, and occasionally Saturdays, until 29th April, there being in all eighty-four lectures. During the last week, which appears to have been given up to surgical operations, there were lectures morning and evening. The fees for attending the lectures and dissections were for the first Course of lectures four guineas, for the second Course three guineas, and for the third and fourth Courses three guineas; after which, or for ten guineas paid at once, each became a perpetual pupil, and had a right to attend the lectures as long as he pleased. Any perpetual pupil to the lectures could for a further ten guineas become a perpetual pupil to the dissections, or for twenty guineas paid at once could be a perpetual pupil to both. Perpetual pupils to the dissections could see all the preparations made for the lectures, and could inject and dissect at their pleasure, paying for the "subject" they made use of. Such as did not choose to dissect for any length of time could be on the same footing as perpetual pupils to the dissections for six guineas for three months, *i.e.*, half a guinea per week. Those who chose to dissect for a short time only could dissect a body at one guinea for one, or two guineas for two students; but these had no right to see the injections, except such as should be made for them at the prices mentioned in a Table kept in the dissecting-room. Half a crown to be given to the servant for each Course on receiving the ticket.

"Teacher gives us a description of the autumn Course of 1775, which consisted of 112 meetings, extending over about 3½ months. The lectures, each of which lasted about 2 hours, were given daily; and evening lectures had to be added to make up the full number. William Hunter delivered most of the day lectures himself, those in the evening being allotted to his partner. There were 2 introductory lectures, 80 on anatomy, 15 on operative surgery, 8 on the making of preparations and embalming, and 12 on midwifery;

the Course comprising the whole medical curriculum with the exception of chemistry, materia medica, and experimental philosophy."[1]

The lectures were given over a period of 36 years, possibly more, and attracted students not only from Great Britain and the continent but a considerable number of men went to England from America to hear them.

To summarize his biography, William Hunter was born in Lanarkshire, 1718, died 1783, in London. Began his course of lectures 1746. Published the "Anatomy of the Gravid Uterus" in 1774. Man-midwife to the Middlesex Hospital 1748, and obstetrician to the British Lying-in Hospital 1749. The "Anatomy of the Gravid Uterus" was composed of 34 very large plates, mostly drawn by Rymsdyk. Hunter had been collecting material for this great work for twenty-three years. The amazing thing about this great teacher was the paucity of his published work, at least from a quantitative standpoint. Aside from the "Anatomy of the Gravid Uterus," William Hunter published only a slim volume of "Medical Commentaries" and several communications in the *Medical Observations and Inquiries*; the "Two Introductory Lectures" appeared posthumously. The splendid and complete lectures to which Hunter devoted himself so unsparingly for 36 years have been lost except in the surviving note-books left by his students.

Several of these manuscripts exist in medical libraries,[2] one of considerable interest being preserved by the library of the College of Physicians of Philadelphia. This manuscript, entitled "An Abstract from Dr. Hunter's Lectures on the Gravid Uterus," is contained in a bound notebook 8 x 6½ in., and it is interesting to note that its unlined paper is of the laid variety and is watermarked with the identical seated Britannia figure which is found in the sheets of the large folio "Anatomy of the Gravid Uterus."

The notes in question were thought by Mr. W. B. McDaniel, 2d, the librarian, to be an abstract from a larger manuscript which might now be in Boston, inasmuch as the Philadelphia manuscript was written at Salem, presumably the one near Boston. In answer to his inquiry, Mr. James F. Ballard, Director of the Boston Medical Library, writes:

"I have a large quarto manuscript, measuring 9 x 7, consisting of about 250 pages, written on one side of the paper, and evidently done by a professional scribe. It is entitled, 'Lectures on the Gravid Uterus, by William Hunter, M.D., F.R.S., 1779'—four years before the death of Hunter.

"This volume belonged to Walter Channing, of Boston, who took his A.B. from Harvard, in 1808, and his M.D. from the University of Pennsylvania in 1809. He was granted his M.D. from Harvard ad eun. in 1812. The fact, I suppose, should redound to the honor of your State. As it was the practice in those days to go abroad for a finishing education, it is probable that Channing was in England some time between 1809 and 1812, when he was granted the M.D. from Harvard. He joined the Massachusetts

[1] G. C. Peachey, "A Memoir of William & John Hunter." Plymouth, 1924. Pp. 127–8.

[2] W. R. Le Fanu, librarian of the Royal College of Surgeons of England, refers to the presence of 24 such manuscripts in the library of the College (*Bull. Hist. Med.*, 1940, **8**, 291). J. M. D. Olmsted has analyzed a volume of student's notes (now in a California library) on Hunter's anatomical lectures of 1775 (*Bull. Hist. Med.*, 1939, **7**, 996–1003. Olmsted attributed the lectures to John Hunter, but later reported Le Fanu's attribution of them to William). The California ms evidently does not contain the lectures on the gravid uterus.

Medical Society in 1814. It is probable that he purchased this manuscript in London, while he was abroad, as there is a price notation of one pound and one shilling."[3]

The Philadelphia manuscript concludes with the notation "Salem, Dec. 23rd, 1786, AP scripsit." Concerning these initials Mr. Ballard says:

"I would conjecture that this is a certain Abiel Pearson, whose last known residence was Andover, Massachusetts. As you know, this is not so far from Salem, and it is possible that Dr. Pearson at one time lived in Salem. We do not know much about Pearson, except that he died at the age of 71, at Andover, in 1827. He joined the Massachusetts Medical Society in 1803, at a rather late age in life, namely, about 47 years of age. Your manuscript, dated 1786, was written when he was approximately 30 years of age. It was evident that this Pearson started his medical career late in life. It is quite probable that he also went abroad for an English education and became acquainted with the work of Hunter. He may even have been there when Hunter was lecturing. It is also probable that he borrowed a manuscript and made notes which were of interest to him. So far as I know, the complete manuscript has not been published, and I find that it contains the same chapters which you mention as comprising your abstract."[4]

The notes themselves consist of 58 pages of small, painstaking and concise penmanship and the first few pages are divided into the subjects composing each lecture abstraction as follows: Of The Catamenia; Of the Imperforated Hymen; The Hysterics; Procidentia Uteri; Of Breeding; Miscarriages.

It is apparent that the first lectures deal

[3] Mr. Ballard very kindly loaned this Boston ms to the library of the College of Physicians of Philadelphia so that it might be compared with the Philadelphia ms. Mr. McDaniel reports that the texts are closely parallel, but with enough differences to suggest that Hunter followed the usual custom of delivering substantially the same lectures in course after course, varying them only in minor details. There are passages in each, for instance, that would seem to place both mss nearer to 1766 than to 1779 (the date on the title-page of the Boston ms), and yet there can be little doubt that these same passages were used year after year without alteration. Certainly the chief point of difference between the texts of the 2 mss is to be found in their respective conclusions. The Boston ms concludes, after an expression of good wishes and satisfaction over the assiduity of the lecturer's students, with this final bit of the somewhat academic Hunterian humor: "I have now finished twenty years (sic) of Lectures. However, as I presume I am still approved of, I propose twenty years more, to begin next October, and after these are over, I intend to settle in the world, and take me a wife." As Hunter commenced lecturing in 1746, and the ms purports to contain his lectures of 1779, one might suppose that this had been the conclusion of his lectures for some 13 years, and perhaps it was. However, at the close of the Philadelphia ms, which does not contain this passage, Hunter is depicted as displaying the plates of the "Anatomy" (1774) and commenting upon them in such a manner as to suggest that the work had, at the latest, just recently been published. For however many years between 1752 and 1774 Hunter may have given a similar demonstration, it seems plausible that by 1779 it had been dropped from the schedule. In that case one would assign the original ms from which the Philadelphia one was derived to about the year 1774. On the other hand, it is perfectly possible that Hunter continued demonstrating his plates up to 1779, and even beyond, and that other mss of the later period may contain this passage.

[4] A note, dated Sept. 18, 1856, on a fly-leaf of the Philadelphia ms tells us that the book belonged to the late Gov. Winthrop Sargent. It is interesting to observe that this distinguished American was born at Gloucester, Mass., not far from the Salem of "AP" and the Andover of Abiel Pearson, in 1753—3 years, presumably, before the birth of Pearson. The Hunter abstract is followed, after 29 blank leaves, by AP's transcript of a Rush article, and an abstract of another, credited to the *Transactions of the American Philosophical Society*, 1786 (the date of the Hunter abstract).

with gynecological matters only, and only after the lecturer embarks upon the subject of midwifery do the notes become more or less continuous.

In order to give the reader a clear impression of Hunter's material and style, the notes on the lectures on obstetrics are quoted in full.[5]

[5] The quotation carries the text from the section "Of breeding" to the end, approximately 40 pages.

## William Hunter Lecturing on Obstetrics and Infant Care

*Of Breeding.* 1st What sort of women are best to breed, to be prolifick, or to have children? If we had a mind to be ridiculous, we might say that the Daughter of a woman that never had but one child, is not likely to have children, but to the Purpose, such women are most apt to have children, that are healthy in all respects, and are young, having their menses regularly as to time, and in proper time, without uterine complaints of any kind, as weaknesses, etc. There are women healthy in other respects, and yet very irregular in regard to their menses. Those who have a great quantity of menses are not so likely to breed as those who have them in a healthy proportion. On the other hand, women with little menses are seldom great breeders. If a woman has a shew instead of the common quantity, that woman is not likely to have children, at least not healthy ones. The same observation will hold good in regard to those that have them at 5, 6, or 7 months interval, instead of regularly every month.

*How Do We Know that a Woman Is with Child?* One should converse with women instead of books upon this part of the subject, for the sake of being ready in conversation upon it. When a woman comes in distress about a child being a cross, she is not at all a judge of what you say, but when a woman comes to consult a man upon the symptoms of breeding, if he is not clear, quite sensible, and ready in his conversation upon the subject, they will naturally have a bad opinion of him. It is not necessary that a girl should have her menses before she conceives, I have known several instances of this sort; and women that such be have not their menses, sometimes become pregnant. I am sure too, that women have had children by men they have so much disliked that they were not capable of giving pleasure, and therefore have no orgasm.

The first common symptom of a woman when with child is the missing of the menses, presently after this she is sick at her stomach, especially in the morning. It is commonly indeed as soon as they rise, putting on their stockings and petticoats. They are very much oppressed in the morning, but little in the afternoon. These are strong marks of breeding. She used to be regular, but now is obstructed, and sick in the morning. These are so strong, that when present, I can almost venture to conclude they are with child. Besides these, there are many symptoms of breeding of less consequence, and not to be depended upon, such as a dislike to particular things they were before fond of, but this often happens when they are not with child. Another very common symptom is great drowsiness, this happens more especially after the first menses. In the first month this symptom is not very distinct, but after that they feel a very unusual drowsiness, particularly after dinner, and many have it in that degree as to fall asleep. Others have a dryness and parchedness in their mouths

even before sickness comes on. When women have had children I always ask among other questions, what were the symptoms. Many breed with a purging, many with the heartburn, but in general they are so well while breeding, that we are seldom consulted upon this subject. It is much more common to be consulted about their going out of town, and we are sometimes asked to give our opinion whether a woman is breeding, or not, most commonly the case is a little doubtful. There are some symptoms present but not all. A woman perhaps finds herself sick in the morning, her breasts full, and growing big and regular notwithstanding; well what of this? I have known women breeding with but little show or sickness at the stomach, and to make it the more puzling not the morning sickness, but such a one as was continued through the day and evening. I always lay a great stress upon the menses, and if obstructed, and other circumstances concur, I always suspect it, if not obstructed, I rather imagine her not to be breeding.

We must form our opinions from experience, and if there is the least doubt from the symptoms I think it is not proper to give a positive answer. We should lay it out so and so, that some circumstances seem to say it is so, others that it is not. But when may we know for a certainty? Why probably when four months are gone. When 3 months are gone they are but a trifle bigger, but in 4 or 5 they quicken, which must afford the best proof whether they are breeding or not. Let them who are young, and of less experience, be cautious in saying a woman is with child or not. You will be consulted especially by women who marry old. They wish to live like young women, they are very desirous of it, and from that very desire, they are considering themselves so every day, and often although they know they are not with child, they will say it. This is distressing to her afterwards, and more so to physical men. There seems to me to be no reason for this. Please her a little, say there have been some women who have bred and yet been regular in the first months, and that others have bred without milk in their breasts; but however it will be time enough to speak positively in a month or two. When from the size of the uterus, and the quickening you will be able to determine whether she is with child or not.

From sixteen to twenty weeks is the common time of quickening; when they begin to advance in their pregnancy and have a great belly, that strutts out, so that everyone appears stupid that does not find it out, you may then advise them to be examined. Let it be as it will, I always give it out, that they will have a child at the end of nine months. When 6 or 7 are thought to be over, I press on examination, and beg for God's sake, not to let the case go on but be examined. On the other hand, I am always to examine in the early months. They will then say, is there no method to see, I will submit to anything. I always put it off, especially if she is a lusty woman, for I find I cannot determine at 4 months and at 5 months I am a little afraid of myself. I venture (generally speaking) not before that time. In thin women it is better. If it should be earlier than 3 or 4 months I know I cannot speak properly. The patient may submit to what is unpleasant for the sake of a little ease, as she is doubtful in her opinion, yet after all, a man most likely must be obliged to look her in the face, and say Madam, you must stay sometime longer, before I can satisfy you. This is very disagreeable, therefore I should not advise examination in the

early months, for fear of not being able to tell. But when farther advanced it is necessary [to] press for their satisfaction, and my own, because it is very extraordinary if after a full examination at 5 or 6 months we cannot be certain whether a woman is with child or not.

Suppose a woman is with child, or that it is taken for granted, when all the usual symptoms appear I have not the least doubt of it. But extraordinary things do happen, and one is never to act in life upon possibilities but upon probabilities. Should it prove otherways, it would be a very extraordinary case. However, you are not to say a woman is not with child merely from talking with her. I remember a person who came to this town with a great apparatus, for lying in at the end of 9 months, but at the end of 10 months being uneasy, they were suspicious she was not with child, and sent for me. She was a big, fat woman, had married late in life and was now fearful that she had been deceived. When I came she had reckoned 10 months. I went through the formalities, and found that she was as much with child as myself . . . I saw the husband and told him as tenderly as I could that these things often happened, but that she was not with child or at least in the latter months. He was much vexed about it, was a little rude with me, as if it had been my business to have got her with child. He turned about and said, Sir, will you take upon yourself to say she is not with child? No, say I, I cannot assert she is not with child. But I am sure she is not in her latter months.

In another case I was consultant for a lady with her first child, who was said to be in labour. A flooding came on and she had been attended by another person. When I came the os tincae was not opened, I examined her and there was not the least feel of a child, and laying my hand low upon the belly, I could press it almost against the vertebra. She was very regular all the time, and yet having a flooding was supposed to be in labour. Let them go and amuse themselves at first, because we cannot convince ourselves, but when 5 or 6 months are gone it is a serious affair, and we are come to a time when we may determine. Therefore when it is not so let us persuade them of the truth. But this we are not always able to do.

When a woman is with child, some are very particular about managing them, but it is best to treat all disorders now just the same as at another time, only avoiding a great bustle, and fatiguing of body or mind, and all large evacuations. Do not confine them, you may regulate their diet, but let them eat such things as they like. If they are costive, which is very common, let them take something that will gently open; such as Magnes. alb: Elect. Len: or ripe fruit. Going on the stones in London is not pleasant, now and then an uncommon jerk may cause miscarriage. Such as have been hurt this way, and afterwards sent for me, I found to have a show, and symptoms of a miscarriage, tho not at the common time, so that everyone who knows how to regulate health at other times, will be a fit person to conduct women in their breeding. In the course of breeding there is just one time in which there is a peculiar danger of miscarriage. A premature labour may happen at any time. But there is one particular time of all others, when women are liable to miscarry. This I learnt from experience. I have looked at books and read them, but you cannot conceive how I dislike what they say, because I find it so different from what appears to me in practice. Thus if I was to write a system of midwifery, another man upon the same subject would disapprove of it.

*Miscarriages* are the simplest thing to understand in the world, they may hap-

pen in any month of pregnancy but generally in the 3rd month.

How long does a woman go with child? The generality of women will go 9 calendar months, and some only 8. Most women have no other reckoning than from their first missing or from their last missing. They might prove with child directly after their last menses, or at any time between that and the next period. A woman may actually know when she is with child or conceives, if she has a visit only from her husband whom she has not seen 3 months before, and does not see for 6 months after. The reckoning of these will be exact, and they go commonly 9 calendar months. When they cannot reckon thus, they must reckon from their last menses or first miss. Some reckon this way, they divide the month and set out from that time. Suppose a woman's last menses were the 15th day of the month and about the 13th of the next she misses, shall I begin the reckoning from the 15th of the former or the 13th of the latter? No, I will set out from the middle and then I can be but a fortnight out. Let it be which ever way it will. I say the common time is 9 calendar months, reckoning from the last menses, but they generally go over it a few days, some a week or fortnight, or perhaps more. Many come at eight months. I know many women who do thus. On the other hand I believe a woman may go 10 months, and sometimes more. There was a lady in this town who went 10 calendar months and 6 days according to her own reckoning, and it was within 9 calendar months of her husband's death. I am sure there was no trick in it, because the husband was with her the first 4 months and then he was in perfect health, and vigour. I attended her as a breeding lady.

There was a woman in the hospital that went 10 months. When a woman is received into the hospital, if she stays a certain time without labour, she is turned out and received afterwards when the labour pains come on. This woman was taken in at 8 months after reckoning. She did not come to her time, and the matron told her the next Friday she must be presented to the Board, if not taken in labour before. Says she, take lodgings near and come in when labour comes on, for I am not to keep women who are merely big bellied. She was ready to submit to the rules of the house but said, I must come in soon, I know, for my husband has been gone to the East Indies and left me such a day of such a month. I have gone nine months from that time, so that I am very sure it is impossible I can go on long unless something very extraordinary is the matter with me. After 10 calendar months from the time, she was taken into the hospital and delivered. From her whole manner of behaviour we were certain that she did not fall with child after her husband had left her, she told it with all the simplicity in the world, and when she went farther than the usual time she was prodigiously frightened. This was very convincing to Dr. Macaulay [6] and others.

These are the reasons why I think a woman goes so long with child. A mare goes 11 months; here we know their whole amour, yet we know they vary as to exactness of time. Why then should it not be so in human subjects? A child that is born unripe has its skin more transparent, there is not that opacity which it has afterwards. I believe with the first child it is more common to go only 8 months. They joke generally here and say that they will go 9 with the next, but I believe there is something in this, because I have

[6] As Dr. George Macaulay died in 1766, the cases in which he figured must obviously be referred to a somewhat earlier date, an instance of Hunter's use of the same material year after year.

known them regular before pregnant, and go on only 8 months afterwards.

With regard to the marks, the want of hair and nails are ridiculous and absurd; they grow from the beginning with other parts of the body, and are seen at 4 months. There is a great deal of silly stuff talked about among the women with child, more than on any other subject. The first midwife or nurse who comes to a young woman with child says, My dear creature, do not lift up your hand, do not comb your head, and so on. She should certainly, when with child, live just the same as at any other time, only keeping more quiet, and avoiding anything that might be hurtful or fatiguing. Oppression and all other symptoms are to be treated as at any other time, especially those that proceed from uterine gestation. If there is a fever, bleed, give cordial medicines, or cooling ones as you think proper. It is rather an absurd practice for men midwives to be called in at every disease attending childbearing. He might as well be called in to set a fractured leg because the woman is with child.

Miscarriages I say generally happen about the 3rd month of pregnancy. Whatever previous symptoms there may be it generally comes away in 10, 11, or 12 weeks, and sometimes in the 13th. Women that are liable to miscarry, find a little faintness, with a shew, and sickness about this time, and this may happen a day or two, a week or fortnight before. Or they may be taken with a pain in the back, sometimes coming and going, but more commonly a shew, and they may have a good deal of pain, as if in labour. Uterine pain most women feel in the back, and at the joining of the back bones, many on the share bone, and the lower part of the body, and many all down their hips and thighs. Those are uterine pains, and they feel them in the same manner as they do the after pains after labour. When the womb is irritated, they have sometimes a pain in the back, and always forward. These are from irritation and not from distention. Commonly these pains are principally in the back, more or less in the bottom of the belly, and shooting upon the thighs, hips etc. Some women with a shew and flooding miscarry suddenly. It comes down within the vagina and continues there till they have occasion for the pot. Some have a great deal of pain, even when the miscarriage is low and small, but if it is larger, the pain is said to be proportionally larger, but much oftener the pain is less.

The pain in miscarrying is not from the size of the miscarriage, neither in labour is it from the size of the child, stretching the soft parts, but a great deal of it is owing to the irritation of the womb, hence a great many women have much pain when they void their menses. From this irritation upon the neck of the womb arises the grinding pains which women have in the beginning of labour, but a relaxation with forcing pains is quite different. The grinding pains they say are worse than the forcing in labour. When the child is pressing into the os tincae and coming into the womb, most women will say their pain is not so bad then, as the grinding pains in the belly are.

In miscarriages there are often great quantities of blood that come away. There is a flooding and they grow faint as if they were dying. But let them lay in that way, and they will recover though they seem to be everything but quite dead. If you give them hartshorn drops or cordials you raise the circulation, before languid, and gush it comes from them again. Leave them in that way, and by and by the blood will coagulate and plug up the vessels of the uterus. Supply nothing externally but cloths dipped in

vinegar, the chillness being first taken off. For raising their spirits if necessary, I have no objection to such a cordial as a piece of toasted bread, or biscuit, dipped in a little red wine. This does neither force or increase the circulation much. I always get the patient up afterwards, sometimes sooner, sometimes later. If a woman has a severe flooding so as to make her faint, 'tis very rare that it returns again, though she may have an ouzing after that.

But common miscarriages I always observed to be of the same size. When I open I find the child to be dissolved in part. . . . Just at the end of the naval string we may discover a little bit of the child, the body perhaps without its head, etc. When the bladder of water bursts the child comes away with the gush of the water, and by examining the clots of blood in the pot, I commonly find the little white child. I found out that the bulk of the child is dissolved at 8 weeks. I am convinced that the time (after the foundation of the child is laid, when the fruit of the womb is blighted as I call it) is at about 8 weeks or 2 months. If a woman goes on beyond that time, she commonly goes on well, if not, she must miscarry. She may retain it notwithstanding in the womb for some days, weeks, or months, but at last it is separated and must come away. During the time it stays the woman is irregular. I thought this was the time and whatever I prescribed was a good deal different after the ninth week, after the 13th was over I used to say she might go out. But of late since I have been confirmed in this, I confine them about the 8th week; when the 7th is up, I know they are about the time of trial or blighting, when that happens they must miscarry, that then is the time of care. All trees are liable at a particular time to loose their fruit, or be blighted. One tree that bears fruit shall bud and blossom as usual, but at the particular time when the blight comes nothing of those buds shall remain. Thus it is with the fruit of the womb, the dangerous time then is about the 8th week, and the miscarriage happens a little after.

If she is in danger of an abortion and reckons right, we are to bleed her at the end of the 7th or beginning of the 8th week, which is about the time of the second return of the menses. Before I used to let them go on to the 9th or 10th week, not knowing then (God help me) that it was determined one way or another before that time. It is very common to bleed women to prevent their miscarrying. A number of women will be in danger from a superfluous quantity of blood, especially if they usually loose a good deal by their menses, and are of a full habit of body. It will be proper to bleed here, and if it is neglected it will happen naturally from the mouth or some other part. However, as venesection sometimes does hurt, it will be proper to enquire into the constitution before we recommend it. Many women cannot bear bleeding and the generality of miscarriages happen from a relaxed weak habit, so that Boerhaave prescribed a little spaw-water and milk, about ℥iij of the spaw water with ℥ij of milk twice a day, which softens it and makes it a little nourishing.

Sea bathing for miscarriages is useful, it came up lately and agrees very well with women of relaxed habits. I have sent several to the sea, and commonly the next news I receive is, that they are as big as they can be. The Tunbridge waters cannot invigorate much, without heating considerably. If a gentlewoman has her house at Tunbridge, I advise her to take a small glass of the water at 12 clock and another at 4, if she has a flush-

ing, I would advise her to go on more cautiously. None can drink much of the Tunbridge, Pyrmont or spaw waters without being heated much.

In London I find many women who bustle about a good deal often miscarry. It is necessary to keep such women very quiet, to restrain them from going up and down stairs especially, if they are in a hurry, or going into the streets, etc. With many women confinement does great good, but in nervous ones it is attended with disadvantages, for not being amused they grow mopish, melancholly, dull, low spirited and then miscarry. However, among other things I try this to see what moderate confinement will do, and have sometimes succeeded.

All the other complaints of pregnancy are to be borne with. Everybody knows the morning sickness sometimes to last thro' the whole day, and that it goes off in the 3 or 4th month, when they quicken; many are afraid of this sickness and vomiting and discourage their eating much least it should be increased and prove of bad consequence, but repeatedly I have seen them after everything is down, both medicine and food, throw it up again, and even bile with it, and yet not be hurt, so that they are not liable to miscarry from sickness or vomiting. They will fill one bason after another with bile, etc., and keep vomiting from morning 'till night, without any inconvenience. As they vomit so much naturally I am never afraid when it is necessary to exhibit a gentle emetic. An artificial vomiting well timed cannot do any harm; at least I never saw an instance of it.

The heartburn and colicky pains with others in breeding women are of little consequence; they bear particularly the want of food extremely well. Why doth a person in a fever loath victuals? Because if you throw food into the stomach lacteals you increase the disorder. A woman with child may be looked upon as in the same situation. There is a woman in town who does me the honour of thinking of me more highly than she ought to do. She consulted me to prevent great sickness and fever when she was six months gone. I made enquiry and learnt a good deal of her history; having much pushed my enquiries, I told her if she would live lower, keep her body open and loose small quantities of blood now and then she would be better. In the first month you say you have a good appetite and are not sick and you keep without any bad symptoms 'till the 5th or 6th month, at which time you are costive, full and loaded with rich blood and consequently have a fever. I apprehend you may artificially by emptying, effect what Nature sometimes does herself. When women are with child they should keep their bodies open with gentle purges, etc., and they will be tolerably well. She took this plan and went her time extremely well. She had had six children before and was always ill. This made her perfectly friendly to me. I gave her a reason for my opinion, and she was convinced I was perfectly right.

It is a good rule for women to prepare for labour by keeping their bodies open. Many make it a practice to take a spoonful of oil at bedtime every night, and they do it with the same view as we oil boots to make them supple and yielding. It does not get into the bones and produce this effect, but it keeps the body moderately open. It would be very disagreeable to fall into labour with a quantity of feces in the rectum.

I have spoken of miscarriages, and whether they come on in the early months or in the 5th or 6th—they require the same treatment or rather care. A premature labour generally comes on with

the same symptoms, and is to be treated in the same manner as others. I need not mention that a woman may have the symptoms of miscarriage without its coming away. Sometimes it may remain and lay in her body some months and then drop away without pain. I have now two cases where the fetuses were blighted at 8 weeks (the common time) and yet lay in the uterus without any considerable mischief for 7 months, one came away at the beginning of the 7th and the other the 8th month. I have one that remained all that time without being dissolved in the least, but the liquor amnii was thick, after washing that away I found the foetus entire. After the fetus is blighted the time and manner of its coming away is uncertain, therefore we should be cautious.

As to labour itself, one of the first symptoms by which we can judge a woman is going to be ill is a little shew of blood. This is very common a day or two before. Besides the slimy discharge, it often happens that the thick jelly comes away which fills up the Os Tincae. When we have the gelatinous appearance of these slimes etc. coming away, I am certain that labour is near. However, I tell them it may be 12 or 24 hours first, and when the pains come smarter I don't call it labour, but say they are grinding ones. Some women are taken suddenly with uterine pains in the back, belly, hips and thighs, others are taken with a breaking of the waters, but a little shew of some kind or other is more common, though sometimes without anything of that kind there is uterine pains. This is not the immediate sign of labour, but it prepares the way. When we are clear of the breaking of the waters, I always say it is presumed they will be in labour in 48 hours, they will go after this for 20 hours, without any other symptom of labour and sometimes even to 30 or 40 hours. Very often they are taken with a purging before. Whenever I am sent for to a woman taken with symptoms of purging and vomiting, which very often introduce labour, I look upon them as safe and favorable. A little puking and 2 or 3 stools empties them and disposes them after to less fever. If all these symptoms happen, they all, except the purging, make it probable that labour is coming on. I have often been in the 7th or 8th months and in the intermediate times called to women in labour, and found the pains stronger and stronger, and yet afterwards they have gone off.

Whenever I am sure a woman is in labour the rule I take is this I say to them, let everything be ready, let the bed be made, and everything quite prepared everything will then be in its place. I likewise say it will be a labour tho it is not perfectly so, and I always keep off saying it is a labour as long as I possibly can without examining. I say after all it may go off for 2 or 3 days. But the principal reason for my being unwilling to say she is in labour is, because from the time I say so, the woman reckons to the time the child is born, and says she was so long in labour. It may run on for 24 hours or 3 days after and yet she reckons the whole time. This makes it very disagreeable, yet I will not allow it to be a labour. Yet we amuse them by saying we hope it will be a labour, which is of great advantage in many cases.

In the incipient pains I make it a rule to avoid examining. When you have examined them they expect you to tell them everything. They want to know how the child lies, how long it will be before it is born and such like questions, when the os tincae is but little dilated. For these reasons I put it off as long as I can. When the pains come to be a little

alarming, especially if there is any other shew, then they are a little frightened, and say shall I go to bed. I answer there is no occasion for that, let the room be darkened, and lay down a little while upon the bed, and I will examine what is to be done. If I find upon examination that the child is right I give them that comfort. If on the contrary, I feel nothing but water, then I say everything is very promising, but they will say does the child lay right. I answer that I do not feel that, that there is nothing but water at present, but that it has all the appearance of a natural labour. This puts them at a sort of loss what to say to the relations in the next room.

I make it a rule to keep them up as long as possible, and never put them in bed till the pains are forcing, for when in bed they think the time very long, but if they choose it, they may lay upon it. Let them drink as at any other time, and make as light as possible of it. In this way there is this difference in the pains of lying in women, the grinding or preparing pains (as all extraordinary ones are of this kind) which open the womb and are worst of all. The patient talks during these pains, which are intolerable, and complains bitterly, but she bears the forcing pains more patiently, and says nothing. If they never had grinding pains before, they will speak in this manner, never was anybody so bad, and yet not die, they will beg when sometimes at the worst to be killed out of the way. In this desperate manner will they talk and rave all the time a pain is upon them. When they keep talking thus, you may be sure they are only grinding pains and not forcing ones, and when it is thus, by letting them go on, I get the time killed, never allowing it to be labour till the pains begin to be a little effectual. When the forcing pains come on they strain and say nothing, these should be attended to and the patient desired to bear down, and be put to bed. When it is time to put them to bed it is then time to have it made properly.

In managing labours, there is nothing I am more careful of than cleanliness of appearance. The nurse is generally with me, who places all under the woman, a double and dry sheet. You will find nothing so pleasing and comfortable to her, and of more use to prevent the taking of cold than such neatness. Some you will find at the time of labour are so negligent as to let the bed be bloody. If there is blood or any other moisture upon the bed, or if the cloaths are left too much open, I look upon it to be dangerous. In order to have everything ready, besides the common things I desire her to come as near the edge of the bed as possible, that I may easily come near her.

I have delivered women in all the different ways, but I think the common English way the best. I do all in my power to prevent cold air, and their being wet in the bed, I pin a cloth to the upper sheet, turning it back so as readily direct my hand, and after the child is brought away, by removing this, you have her quite dry, so that managing thus, I had rather have her with a shift only, than with a shirt with it; besides what is on the bed already, in order to take care of everything, and totally prevent cold and wet; I get another sheet and double it the size of my handkerchief, this I put farther under her, to prevent the bed as well as the shift from being wet. As soon as the waters break I have 2 or 3 cloths to take them up and get them away as fast as possible. There is advantage in proceeding after this manner, for as soon as all is over, the sheets, etc., being removed, she is left quite dry and comfortable, so that keeping them thus neat and clean to

prevent their being hurt, there is not one time in 10 the patient is in the least injured.

When labour is actually present I do little or nothing. In the time of a pain I support the back a little with my hand, rubbing on the lower part of it, then introduce my finger and stretch it a little round the vagina and os tincae. Thus I assist a little but leave it principally to Nature. Assisting much is extremely improper; though I pretend to be doing something, yet I do very little for them, and hardly anymore than to take off the reproach of doing nothing at all. At the first child I am so far from hastening the labour that I had rather retard it, but when the vulva is tight and as thin as paper I support it properly with my hand on the perineum and do not let the pain have the force it otherwise would have. I desire them to be patient and tell them that by suffering a pain or two, it will be more easy afterwards. By practising thus slowly, it is very seldom that any of my women are torn much. Just as the child is coming into the world, I always put my hand upon it, to regulate it, and the other underneath to support the perineum. At the extremity I always beg of them not to be in a hurry and tell them that at least it is better to bear 2 or 3 pains extraordinary than to let the child come away hastily. The comparison I commonly make use of is this, that it is like putting on a glove, which if done hastily will tear, but if slowly will be attended with no danger.

When the head of the child is delivered, I get the neck of it between my fingers and pulling gently draw it out gradually towards the mother's belly. At the same time I keep a finger on the perineum with great care that if it cracks it may not tear far or extend to the anus. Before the child is born I commonly get a thick pillow between the knees, by which the parts are more opened, and there is a great deal more room, but I generally make it late before I call for this knee pillow. As soon as the child is born I get a clean cloth that is very dry and put it all under the woman, and a clean cloth to the vulva. I commonly have part of the cloth that is on the bed upon my knees, to receive the child, and immediately cover it up. After this I lay my hand upon the belly and press the air from the uterus. When the air is out, the parts of the uterus begin to contract, and close, after the child is born a good deal of air rushes into the cavity of the uterus. I have suspected this to be unfavorable that it might have a bad effect, and be productive of fevers in child bed, attended with an inflammation of the uterus, therefore I am afraid, and to prevent such consequences gently press the belly and uterus, by which the air is pressed out so forcibly as to be heard; this being done I tie the naval string secure, cut it off and give the child to the nurse, having first felt whether it was a boy or a girl. As the naval string towards the mother bleeds, I put it in a cloth on the bed, and then desire those who have the child to examine the naval string.

A purging in the time of labour is favorable if it does not continue afterwards. A shivering in labour is of no kind of consequence; as to cramps, the best way of managing them is by rubbing the leg or foot. We know it is owing to the muscles of the leg being affected, and therefore we should rub it. Fainting is very apt to arise from cowardice; a moderate flooding is not to be regarded, it is very common and therefore not much to be attended to, if the labour is in a forward way. I am commonly very little alarmed at it.

When the child has been born some little time, in order to make the placenta come away a little easier, I snip the naval string to let out the blood, then I make it a little tight and just introduce my fingers to feel whether it is within my reach. The hurrying away the placenta is just as bad as hurrying the labour, and the forcing away the placenta is a terrible practice. In a little time if left to itself the grumbling pains will come on, the burden separates easily of its own accord, and there is no flooding at all, but just a little blood comes away after. By the time the placenta separates, the uterus contracts and there is little danger of a flooding. But often the hand is introduced to tear away the placenta from the uterus, by this means the substance of it is torn, or a flooding brought on. The vessels pour out a large quantity of blood and she falls into a fainting fit, from which she never recovers; thus many poor women have been destroyed. A dangerous flooding may likewise be produced by hurrying away the placenta, by coughing, sneezing, etc., therefore by letting the placenta stay, I have had no such thing as a flooding. As that comes away I know it will be followed by a suction of air, on this account as it comes out I close the vulva and keep my hand on the part below. Then I call for a bason, give it away, and apply a dry warm cloth to the vulva. Nature does more of this art than any art can do both for the mother and child, and therefore no art at all should be used. I know this is an improvement of infinite consequence.

Just before I attempt to take the placenta away, I put my hand upon the belly and feel if there is another child, and to press out the air, by which the uterus will contract. If the flaccidity of the belly makes her faint, I give her a little jelly or some other gentle cordial. After this I apply several cloths, and then ask for what is called the close. I keep the parts close with my hands and then take one cloth and apply it over them dry. I take another and put it about her thighs, etc., and give her another to put over her stomach and belly. If she has sweated much, I get more cloths and put them all under her shift and call for a cambrick handkerchief and put it over her shoulders, neck and breast which makes it very comfortable. When she begins to sweat, the getting of fresh, dry cloths and putting them about her is of great use in preventing her from taking cold.

By hurrying the placenta away parts of it are often left behind, or mischief done to the uterus. Every now and then the placenta will remain for a day or two. I once sat with a lady whom I delivered some time ago 2 or 3 hours before it came away, it staid all that day, the next night, and two or 3 hours beyond the 24th, but at last it came away whole and entire. A gentleman came to me to consult about a placenta that had laid behind a great while. I desired him still to leave it, she had been a good deal frightened with the management of her former burthens after she had been delivered of the child. They had waited all day yesterday, last night, this morning, and still it did not come away, and the midwife says the womb is closed. Is there any floodings, pains or complaints? No. I owned it was a long time, but said it would come away at last, and therefore I could advise nothing but steadiness. It is a disagreeable advice, because all the world will be against me. I said whenever you are in disgrace, I will come into the city and share it with you. On the morrow morning the doctor wrote to me that she

wanted to make water in the night, and it came away completely.

Thus we have gone through the treatment of a natural labour. If I was to give an account of myself, I think I may say I have never been of more service to mankind than making it my practice and advice to leave the placenta to Nature. In common cases, nothing or almost nothing can be done, and notwithstanding this, I find, whenever I commit an error it is in consequence of my being in a hurry. There is no misfortune can arise from the decidua being left behind, it will only occasion a few after pains. The great art in conducting labour-pains, is to do little, wait patiently during the grinding pains, to leave all to Nature, and particularly not to hurry the birth of the child, or the bringing away the placenta. At last take care that the woman be left quite dry, and free from the wet and blood, and that she catch no cold. If a woman has a mind and can sleep, let her do it, if she can the moment the child is born.

In the next place, let us suppose it a hard labour, yet the child comes right, a hard labour with patience does as well as any other. These labours are as often ill treated as others. When a woman has held out many hours, they have commonly gone to the forceps. In all these cases I recommend fortitude and patience, the forceps are seldom necessary and all my patients from these kind of labours have done well. Although you are doing little or nothing, you should make her believe you are doing something, you may rub her back and support it. Though the child's head may be larger than the common size, yet if you have patience and allow the proper time, it will grow longer, mould itself to the passage and at length come away with ease, so that the woman shall recover. I make them believe I am doing something and for these 9 or 10 years past have never lost a patient who has had a fever after such a severe time. Many have been dreadfully and long ill, with great weakness and yet have done well at last. I have lost many patients of a fever, but it never happened to any of them who had a hard, long time. It may be matter of accident but all those who have died of fevers in my knowledge have had natural labours. When a labour has gone on a long time the husband and all her friends are frightened, and when it is over they thank and bless God for the woman and child's being alive. They are suspicious there is great danger, all is quiet and there is not the least trespass of any kind, and she does everything that is desired of her for her recovery. But when the labour goes on well, they will eat and drink whatever they have a mind to, and they will talk and make a riot. Then they find a shivering, and beginning heat, and then a fever, so that when they have a bad time they will do everything for their recovery, but when it is a good one they are very often too negligent. I will leave my reputation in your hands who will practice midwifery and may have great experience, if you do not hasten but leave it to Nature. It is inconceivable how much it will do, and when it is over they will do just as much as anybody.

In the other methods of turning children, using forceps and bruising mothers and children, ill consequences will often happen. The great errors that are generally committed proceed from rashness or forwardness. We are greatly improved in midwifery within these 20 years past. What is the great improvement made? Why I am proud in having some hand in it, it is bringing

it back to Nature. Everybody who have lived in this town a number of years tell me they are sensible of the difference of having fewer children born dead, and what is the reason of it? It is only within these 20 years that women have had men midwives universally. Formerly they were only retained in the house, and called for occasionally in difficult cases. Then it was with the Chamberlains and others. What was the consequence? All cases were difficult and so bad before they were called in that everyone was frightened. On these accounts they could not know what Nature would do, and therefore were immediately to have recourse to Art, and whenever they had opened the child's head it was thought they had done a great feat. But if they had understood midwifery and what great things Nature was capable of doing, they would have acted as I do, and seldom have had occasion to act in that manner. We in great business see what great things Nature will do, and what she will not do. I imagine that 19 times out of 20 a labour thus conducted will end well. On some occasions it may be right to use the forceps, but taking all things together, my opinion is, where they have been used, 19 times out of 20, they had better been let alone. For my own part I have not taken a pair of forceps these 10 years, or anything of the kind, and if they cannot give me a pair of scissors to cut the naval string I must bite it asunder with my own teeth, and such a case now and then, as in a year or two I have.

When I think it proper to use the forceps, I see first what Nature will do. Sometimes when the head is large and comes down slowly, when the woman is rendered weak and exhausted, and the pains are become trifling so that Nature is ineffectual, the forceps may be used, but I apply them with great caution, and the utmost delicacy in the world. In the next place, suppose the child's head to be ill-placed, that is instead of the occiput's presenting, the fontanel should, with the face to the pubis instead of the sacrum. In this case I do not turn the head round in order to deliver it, but 19 times out of 20 leave it to itself to come away as it will. And until I see the child hurt, I always presume, that it knows which part should be forward and which backward. So that in general, in different presentations of the head and face I do just nothing at all. Perhaps she may be 2 or 3 hours longer in labour, but give her time and the child will be born unhurt, and the woman well.

On the other hand, if you attempt with the forceps to turn the child's head one way or another, you will probably kill the child, and very likely rupture the uterus, and if the womb is once torn, the woman will die also. Indeed, what does 2 or 3 hours more of pain signify if it cannot be of any bad consequence. It is true it is dreadful to stand by them in such a situation, but then the conviction of its being the safest, will carry us through.

Another unnatural presentation, as it is called, is by the feet, knees or breech. Sometimes it will present with one foot, sometimes with 2. When with 2, always let the labour go on. But suppose the breech presents. The general rule taught formerly was this. When the labour was a little advanced, to put the child back into the pelvis, and to go up along the child's side, and bring it down by the feet. But whenever with me the child presents with the breech I let it go on. The body of the child with the thighs double makes a great mass, but though

it is difficult I rather let it go on, than go up for the feet. A great deal of mischief may be done by bringing down the feet, but if I could bring them down by word of mouth I would not do it, let the child come which way it will, at either end, by the head, feet or buttocks. I let it go on, and take its own course. When you bring away a child by the feet, the head is delivered last, and there is great danger of its life, for when the body is out the naval string is compressed, so that if the child is long in the birth, it is strangled and dies; you must then bring it away soon or you loose the child.

As the head is the most difficult part to bring away, I think it favorable if the breech presents first as it widens the passage and prevents strangulation. Therefore I have often suffered the breech to come first, in order to prepare the parts better. This does no mischief at all, it only makes the labour a little more severe, but then it is safer. And if you should attempt the delivery by the feet, when the Os Tincae is not sufficiently open, you are in danger of loosing the child, or pulling its head off. If the presentation is in any of the ways mentioned we let the labour go on, but if the child lies quite across, if upon going up the feet, the back, belly or head presents you must bring it away by the feet. A case of this sort seldom happens to me. I have not turned a child, I cannot tell when. Many people when the head is a little unfavorable, go up and turn the child immediately, but I look upon this as dangerous. I turned a child once in the hospital. I introduced my hand with a great deal of care, turned the child and brought it away without any difficulty, pushing the head up steadily, as I had been directed. She fell into a weakness and died. I invited several of my friends to come to the hospital, when upon opening the body we were convinced that, in turning the child, I had ruptured the uterus, so that I am certain a small force will do it.

In this and all cross cases it is necessary, when the child presents so, to wait patiently till there is such a considerable relaxation of the uterus, as to readily admit the hand, and then the sooner you do it the better, because then the waters are running off and the uterus becoming more and more contracted. When I turned a child first, God knows, it was a labouring piece of practice. The common direction was when in pain to push up your hand; this was terrible advice. In order not to give her pain, when Nature with all her force was pushing down you must push up. The uterus is very tender and easily torn, so that by proceeding thus, the head and neck must generally go through it.

The general rule of my practice upon a woman (whatever operation of this kind is to be done) is to use no more force than is absolutely necessary. So much I apply, but not quickly or by jerks. I do it like nature herself, very gradually, and never attempt to go up or down in the time of a pain. To convey my meaning right, I attempt it with as much gentleness as possible, and exactly as I would do, if the thing was practicable upon a woman asleep without waking her. Suppose her asleep, I introduce my hand gently by little and little, as slowly and steady as possible, let there be no jerks, or hurry of that kind, for a woman cannot bear them. Work slowly and in such a manner as not to do hurt. Some say stay till the time of pain, and then go up, but this is the most dreadful practice in the world. To go up with the hand while Nature is pushing down is the most terrible violence that can be committed, therefore wait till the pains are

gone off, and then go up with your fist clench, but the thumb along the palm of your hand, and your fingers straight. Thus in the intermission of a pain, you enter your hand gradually and push up gently. Always stopping when a pain comes on. The instant the vulva is got over, the hand is easier. If in this I raise a pain, I stop my hand, and rest there. I go on slowly as far as I can, till the irritation brings on another pain, the instant it comes on I stop, and do not pretend to work against pain, but the instant there is a relaxation I go on. If my hand is at all tired, I put it into that position which is easiest. I go on thus and bring down the feet in the best manner I can. When they are brought down the chief difficulty is over.

Writers I am told mention a great deal about turning the child, and that when one hand is numbed or crampt, we must withdraw it and introduce the other. Indeed I have been sent for by a gentleman whose hands were so crampt that he could not go on any farther. But by proceeding in the slow manner I could turn the child with one hand and eat bread and cheese with the other. For these 12 years past I have seldom had occasion to turn. Whenever there is, I would have you make use of this method of taking time. By letting my hand rest during a pain, and working slowly in the intervals, I can turn a child and bring it into the world with the greatest ease, and then I find the woman is not a bit the worse for it afterward. But any violence will be followed with ill consequences.

When the naval string presents before the child's head, and especially if that is ill-placed I do not know how to act myself or to give directions about it. If the labour is likely soon to be over, leave it. But if it is a long one, the child must be lost except you turn it, and that is a great violence, and often destroys the mother. The child will be commonly found alive, if you irritate the parts so as to promote the pains, and hasten the labour, and it would be right to do this for the sake of the child. So that you may leave it to Nature or turn it, as the labour is likely to be long or short.

There are two things at the time of labour that I am terribly frightened at (and all the others I don't care a sixpence for) one is a *flooding* and the other *convulsion fits*. A case of real danger that is always terrifying is a flooding. It generally proceeds from the placenta's bearing down near the os tincae, here I believe it is of great moment to hasten the labour. I give my patient nothing hot but keep her cool, and put vinegar cloths about her. If her pains come on encourage the labour as much as you can. If the flooding continues and increases to a great degree, I deliver immediately. Many a one I have conducted in this manner with success. A great deal depends upon speaking well to the woman and keeping up her spirits. By pressing comfort you gain her confidence, and she thinks herself happy in being in such hands as will save her if possible. About 2 weeks ago I had two ladies taken with a flooding at the same time, and they both did well. One was taken hastily with a flooding, she sent immediately for me. When I came she was in fainting fits, sinking and pale like death. In that state the blood came from her through the seat and as I came up it was running from her upon the floor. Say I, what is the matter, Madam? It is going from me, (said she in a weak voice) very fast, What of all that, Madam, says I, I would not give a halfpenny to have it otherwise, without it was for making you easy. Her maid and I lifted her into bed. We took away her cloths and

petticoats and covered her very lightly that she might not be too hot. I could not venture to turn the child in that condition. She was so very low that I called for a glass of wine and gave her a bit of toast dipped into it. After that she was immediately better. I then put fresh cloths on her and called for others in order to see it went on and found it was becoming less. I asked her if she felt any pain, to which she replied no, so that I could not examine her for fear of removing the clots of blood away, and setting her to bleed afresh. I staid with her I believe an hour and an half without any return of it. And then as there was no pains, I left her. Says I, there's no labour present and therefore no business for me, you will do, Madam, just as well without as with me. A little while after this she fell in labour and was delivered of a fine living child. In certain situations when we see them likely to bleed, and it keeps getting out, you must take care not to let her go on, till she is too low, but in the most cautious manner turn the child, and deliver her. If you proceed too hastily, the struggle of the labour often produces such a gush of blood as that she dies upon the spot, so that they must be delivered with a great deal of caution. By acting thus I have not lost a single woman by a flooding these 16 years.

Another terrible case is convulsion fits. When a woman is in labour, if she is taken with convulsions, we should use no violence, but promote the labour and get it over as fast as we can. If she is not in labour the conduct must be according to the circumstances. I have a great opinion of bleeding in these fits, and giving large and frequent doses of opium. Commonly I bleed first and then give opium. I have no objection at all to a blister. But generally after one or two fits they lye quiet, insensible, and appear in a manner as if dead. When it is thus, nothing hardly but putting on a blister can be done and yet I never saw them of any great service, so far as I can learn from my own experience, not only from my private patients, but also among those I have been called to about town with convulsions, and treat them as you will generally speaking, they kill one half of them. At the time Lady Lincoln died, I found that those I attended myself, and those I was called to about town did half of them die.

The convulsion fits I have seen have all been of the same kind. They are generally in the first fit before we know anything of it, when they are watched afterwards, and are going into the second fit they have different gestures in their face, they have a rolling and then a fixed straining of the eyes, a slavering at their mouths, and a twitching of their hands. They are at first quite in their senses, but on turning their heads on one side are seized with a convulsive sobbing. These are terrible symptoms in labour and they grow stronger and stronger for some time, then they come out of them and afterwards remain insensible with now and then that particular sobbing. Thus a lady in Palace yard lately was taken with 3 or 4 fits just after she was delivered, and died in 24 hours. However, when these convulsion fits happen just at the time of labour, if you dilate the os tincae with care, turn the child and deliver it as soon as you can, the woman will often recover even then.

Forceps cases I have already spoken of. Never wish, gentlemen, to gain reputation by doing your business quick. Take time particularly in applying the forceps, and when the pain is off unlock them that you may not hurt the child's head, and when the head is delivered I

often take off the forceps in order to have my hands more at liberty to support the woman. In a few instances I think the forceps are a useful instrument. To a poor woman quite exhausted they may do good, but I would to God they had never been contrived. I am convinced the forceps have killed 3 women, I may say ten, to one they have saved. However we never will use them but where they are necessary.

Crotchet cases come next. Suppose the child's head so large that it could not pass in a crooked pelvis. If you wait a considerable time you will often see that though the child's head is large it will be born alive, at the least it will come low enough to be delivered by the forceps. After having given a woman a fair chance to no purpose, it would be cruel to leave her any longer in misery, but first be sure that Nature can do no more before you open the child's head. There cannot indeed be a more painful trial to the woman, yet if Nature will deliver, it is much the safest. When I first had occasion to open a child, it was a painful operation, my hands being always much cramped. But since I have taken the method of allowing proper time, I think it very easy to me. That operation which I used to perform in 5 minutes, I am now half an hour about and not at all fatigued; as this is much easier to me, so it is much easier and safer to the woman. It is much better to be an half hour or an hour about it, in which time it may be done with the greatest safety, and will probably end well. Taking time about it makes it better for the mother, better for the child and better for the operator.

It is done best with the scissors. Having opened the child's head I introduce the hook slowly, guiding it with my fingers. When this is within the skull I fix it with my hand and taking hold of the hand I pull steadily. This gives way and the piece comes out. I then push up my hand, and pull the skull in the direction of the pelvis gently. After this I apply the hook again, and get out another piece, by this means I lengthen the head and mouth to the size of the pelvis. Then I turn the hook around the brain, which runs out and the sides of the head press in so that it flattens. She begins to have her pains return which succeeding she is delivered, and recovers. How injurious, dangerous and fatiguing must it be to perform this operation in 5 or 10 minutes. For a number of years past I have found that those treated in this way recovered just as well as any others. My instrument when I am working slowly does not slip, by which means it might run through the vagina or bladder, and if it is done in a hurry such mischiefs are likely to happen. It has been a rule to get the crotchet up behind the head, and lay hold on the top of it, but this is vastly unfavourable, and to get on the top of the head is far from being desirable, because it is unnecessary and hurts the woman a great deal.

In the next place with regard to twins, after the first twin is born, I press my hand upon the belly to help the uterus to contract, and feel if there is any other child left behind. If the waters gush out and there is a second child, it comes away with a great deal of ease. I do not tell the woman that there is a second child, till it comes away, but make her think that it is the placenta. I would say to her, did your burthen use to give you much pain? It appears to me to be large this time, very often it gives me no pain at all, but when it happens to be large, it does give considerable, and when it is over I tell her it is another child. If I had told her

so before she would have tiezed and made herself very unhappy.

The common rule when there are twins is this, as soon as ever the first child is born, is to introduce the hand and deliver the second immediately by the feet. But it is better to wait half an hour, and then, if there are no pains coming on you may break the membranes and deliver the child. One case I had of a lying-in woman, that I attended with Mrs. Draper, after the labour was over, she wanted to go somewhere she said, and when she came back again there had been no pains. I wanted to go also myself, and as she had no pains for some time we both left her, and desired when they returned to send for me alone. There were no pains all that night. In the morning I returned, and found another child which had been moving and thereby betrayed the secret, I should have like to have let it go on, but they would not let me, therefore I introduced my hand and brought the child away.

*As to the Dead Child:* It is in every respect born like the living one, only if we are certain of the case, we pay less regard to it. If it is a very great child in a narrow pelvis, and the naval string has been out some time before the head, and is grown cold, you may then deliver it as you can. The ruptured uterus sometimes happens from a violent fit of coughing or vomiting, but more commonly from rough usage, as in forcing up the head, and turning the child. Whenever it is ruptured, I take it for granted the woman will die. She may live 10 or 12 hours, but at that it is sure to be fatal. In this case it is not a pin's consequence what you do. In all these kind of ruptures, that I have known, the woman has had severe vomiting. Therefore I am very uneasy if a woman has vomitings after labour. I am told that ruptures of the uterus have happened without vomitings. But in all the cases I have seen, this symptom has always attended the patient.

*The Inverted Uterus* happens to those that are in too great a hurry to bring away the placenta. They pull at the naval string and bid the woman press down, so that the uterus in that loose and lax state is thrown out of the body, or by separating the placenta, with the hand, the uterus is brought along with it. I have never seen a case of this kind. We had one at the hospital, where the uterus with all the secundines were forced out of the body, the matron terrified sent for Dr. Macaulay who came immediately. The uterus was regularly inverted and the placenta still adhered in part to it. He pealed off the placenta as far as he could, and returned the uterus as quick as possible. But she died of the hemorrhage in the very act of returning it. This happened also to another woman. Hurrying away the placenta is the worst thing in the world. It is happy it seldom happens. Whenever it does, there is not the least time to be lost. Beg her to lie as still as she can, and then reduce as quick as possible. Don't be satisfied when it is in the vulva, the uterus may be within that, and yet be inverted. You must go with your hand and press it into the abdomen, you may press it in its natural state. It must be done immediately before it contracts, for you have seen a contracted uterus, that could no more be inverted than a sack. But when it is soft, loose and lax you may invert it. When it is inverted a flooding and death often ensues, so that if they do not expire immediately, they drain to death at last. I have known two cases where they were contracted to their natural size, but had no os tincae, in the place of that was the

fundus uteri. In both these cases the women were exhausted of blood for a number of years and at last died dropsical. They had no enjoyment of life afterwards, and therefore they might as well have died in the fainting fit. These inversions generally destroy after the first time.

*As to Extrauterine Productions:* I have nothing particular to advance on this subject. Whenever they happen they are very dreadful. There was and is a poor woman from whom the pieces of a child were taken out of the rectum. There was the shape and figure of the spine, which I pulled away. And at different times I brought out in the same way nearly the whole bones of a fetus. Yet after all she is now alive and very well.

I shall say nothing relative to the milk, whether the mother is, is not to be the mother. When a woman is delivered, for the 3 or 4 first days, let her be kept as still as possible. If she is to be a nurse, let the child be put to the breast as soon as convenient, by which means we often prevent milk abscesses, and it will be proper to cover the breasts with flannels, or hare skin, which is better, but if she does not pretend to suckle, wet the breasts with a little sweet oil. Avoid astringents or anything which will backen the milk, for such things are improper.

We shall next proceed to those accidents or symptoms in or after labour, which require any treatment. First of after pains. When they are moderate and natural, they do no harm. They make the woman very weak, but I never once got a fever, or any other kind of mischief from them. However if they are violent, opiates are the only method of relief that I know of. 2nd—When the perineum is torn, lacerated or ruptured, I don't know how it can be managed. If it is not in the gut it does no harm. But if it is extended into the rectum, the woman is never afterwards capable of maintaining her stools. When it is lacerated can it be healed up by sewing the parts together? I profess I don't know, I have seen it twice tryed, but in both cases unsuccessfully, tho' some say it will do, and heal up very well.

A suppression of urine is very common after labour, from pain and inflammation. You may let her alone for some time, but not too long. When it is troublesome it ought to be drawn off, and she ought particularly, to avoid cold. In all cases I am very fearful of clots coming to the vulva. The bladder is some times torn or ruptured, or tourn in labour. Or it is bruised so by instruments that it suppurates, and opens into the vagina. This is a terrible case indeed; whatever produces it the urine always comes away in such a manner as is incurable. So many of these things I have known happen, that I have an exceeding antipathy to any kind of instruments, unless used with the greatest caution. Wounding instruments are very dangerous and bruising ones are apt to injure the parts, so as to make them go into a state of suppuration and abscess. I have known several of this kind among poor women after labour—for they do not easily heal up.

*After Labour* there is nothing more common and terrible than the milk fever or child-bed fever. This fever which I now mean to speak of, is in Brittain and France, improperly called milk fever. Because that fever which comes after the appearance of the milk, and is properly called so, is of no consequence at all, and the patient always gets the better of it. But the fever I speak of generally attacks the patient

before that appears. In 20 or 36 hours after labour, if no sweat breaks out, they are taken as with an ague fit. There is a strong shivering with great heat, which is succeeded with a pain in the limbs and back and a violent hurrying pulse. Whenever these symptoms happen to women before the milk appears, from 6 to 36 hours after labour, if they are not cured the 3rd or 4th day, they generally die. 'Tis very seldom that they live above 3 or 4 days, some however, recover. In some there is purging with vast pain, tension and inflammation of the belly. Treat them in what manner you will, at least 3 in 4 will die. Upon examination the uterus, all the viscera, and every part of the body will be found to be inflamed. There is a quantity of purulent matter in the cavity of the abdomen, and the intestines are all glued together. The disease rages so violently that every purpose of Nature is set aside, and there is no milk at all secreted in the breasts. From what I have seen at different times, and in private practice this fever often happens, and yet when it does it is the only case in the practice of midwifery where so little is to be done. I should certainly not desire to mislead you through any inclination to puff myself, but whatever is useful I would communicate to you. I would first observe that in the hospital I saw a great many of these kind of fevers, and particularly one year it was remarkably prevalent. It was so bad that not only even gentlemen belonging to the hospital, but all our friends in town had a consultation whether we should not shut up the hospital. In 2 months 31 of them had the fever and only one of them recovered. We took various methods, one woman we took from the beginning and bled her. She died. To another we gave cooling things and she died. To a 3rd we gave warm things such as confect: card, and mithridate, etc., and she died. We tried thus to save their lives but everything failed. It was the same in private practice, at least 2 out of 4 died.

Whenever a high bed fever happens after labour, it is generally thought to be owing to the milk, and among other symptoms, at the appearance of the milk, there are shivering fits coming and going, which do, however, ease of their own accord. But if these symptoms happen 36 hours after labour, a fever is to be feared, and if it does not entirely go off or become greatly diminished with a full sweat, she will be in great danger. We have thought that women have escaped this fever by taking a large glass of brandy as soon as the cold fit begins. This brings them out of the cold fit into the hot one, and we imagined that it went off afterwards with a sweat. Upon the whole we find that gentle purging in the first attack, is of great service always. The rule in the hospital is to give a glass of brandy first, afterwards a dose of Elect. Lenitiv: which gives them two or three stools, and does good, the fever always ends in a purging, so that thus beginning with a purge is of great service.

This fever kept me in a constant hurry. It might be merely accidental that I had more patients who died formerly than at present, for I have not lost one for more than 3 years, but perhaps for 3 years to come I may loose many. The last patient but one that I lost, died of the true malignant fever, and it was attended with the same pestilential eruptions as at another time. I believe it is owing to my taking more care and caution that they do not take cold, avoiding everything that is the least wet or cold about the woman's body. Every now and then I do suspect that the fever comes on

from the woman's taking cold. It is too common to let a woman lay an hour or two after labour before they are shifted. This every now and then lays the foundation for fever. It is doubtless right to keep them as warm as possible and comfortable afterwards, at other times it is universally acknowledged that wet and cold produce fevers, and is it not likely that they will produce fevers at this time, also. It is not bad ones that bring them, for they generally come after easy labours. I should be glad to know for a certainty whether these fevers are produced from a cold or not. If they do we know how to prevent them, which is almost as well as to know how to cure them.

I have seen 2 cases of the hemiplegia lately. One was a very remarkable one. Lady Donegall had a very good time and thought herself as well as possible, but in the evening of the 13th day she was taken with a hemiplegia. She was setting with her mother in the room comfortably well. Her mother turned her head round at something and when she returned it, she saw her daughter upon the carpet on the floor in a fit, this was succeeded by another, which affected one side with a palsy, while the other remained pretty well. After delivery mania or madness sometimes happens. I have had several such patients, and have been called in to several others. If it is a mere mania with any other disorder, all of them do well after some time; I never knew anything that was particularly useful in them. Stimulants, nervous medicines and blisters have been administered, but the patients have gone on as at other times, talking nonsense till the disease has gone off. It is a species of madness from which they generally recover. Monsieur Ponceauz was a man of great experience in midwifery, he was a good practical man though no phylosopher, after his death his papers were published, particularly some memoirs concerning the milk falling upon different parts of the body. Among other things he thinks the milk falls upon the brain, and causes madness, which says he is always reckoned incurable; but in reality it is not so. Then he tells us of 2 or 3 cases which he had cured. His general method was by physicking and curing, for says he there is too great a quantity of milk in the constitution, and I bleed to evacuate it. In general this species of mania comes by itself, and yet in France it is common to a proverb that it is incurable. I imagine that in my practice I have seen about 20 or 30 cases of this sort, and all of them did well, so that I should suppose the madness of France and England is different.

The iliac abscess happens sometimes and frequently drains women to death, but at other times they recover, little can be done for them. Often after lying-in, about the 12th day there is great pain in the groin, and about the hips, the pain shoots down and goes across the leg, the parts swell and are very tender. I have known it go off in 10 or 12 days, and I have known it continue a month. You must guard against cold, and apply proper medicines and you will get rid of it.

In lying in peculiar diseases are to be managed as at other times, all diseases are of consequence in this weak state. And thence that the lying-in fever in general proves so dangerous. All fevers and diseases of any consequence are attended with more danger in childbed than at any other time. As for instance, if they have the small pox, they seldom live above 10 days. If she has an intermittent fever or ague, give the bark freely, it will not at all interfere with the

lochia. The moment after delivery I have given the bark as freely as at any other time. The first full trial that I made of it was to a woman that was taken ill of a dreadful shivering. They were frightened and gave her a glass of brandy. The poor woman was taken with an ague fit just after delivery. I came an hour afterwards and told them as soon as the fever was off, to begin with the bark, and continue it every 3 hours in order to prevent a return. They did so, there never was the least inconvenience from it and she recovered. There was a consultation about a Duchess in a similar situation, whether the bark should be given in quantities or not. It was given without the least inconvenience, and she was cured.

There is a complaint which happens often after labour, which young practitioners should be acquainted with. When a woman begins to come about, she sometimes feels such a pain and weakness at the share or at pubis bone that she can hardly place her feet to the ground. It is some time before she can stand, there is a great weight, and she is weak and faint. These are very bad when she stands up and less when she walks, they always go off, so that they are quite well at the end of the month. I have seen a great many of these cases, and therefore when I am consulted I tell them they will be well in a month's time, and it does a patient good to give our prognostick, especially when we can do it on the right side.

Now with regard to the child, marks and monstrosity in children, though it is an old notion that they depend upon the imagination and longing of the mother, yet you will remember this is without any foundation. There is nothing to support it but vulgar opinion. The common doctrine of witches is better supported than that of marks. The longing or imagination of the mother can have no effect in producing marks. It is a very weak proposition and contrary to all physiology and experience. A great many ridiculous stories are told by the world, but they are all contradicted by facts, so that I am sure that if the mother has been frightened by seeing certain things that it has no effect upon the child, as I am sure it was begot by a man. It is not a little mischief which follows this notion, because we find it makes a woman very unhappy, no good at all can be done by it, but a great deal of hurt. Frequently the woman is effected so much by it as to miscarry, and if there happens to be any marks upon it, they are sure to have been placed there by the imagination. . . .

It will be necessary to ask the day after the child is born whether it has had a stool, and has made water. If they say not, one should look to see whether the passages are clear. A few days after the child is born if it grows there will be no occasion for medicines.—A week after, the little breasts swell, grow hard, and there is a fluid which they call common milk. I never saw any of these to be very sore, they are commonly painful, but by applying a cataplasm, or rubbing them with a little sweet oil, they get well. All little pimples and eruptions in children are called the red gum. In general I think it is best to leave them to themselves, the more they come out the better. I like them because diseases of the bowels are often cured by them. Therefore they should be a little attended to, but how may they be brought out? why six grains of Gascoins powder will bring them out.

The thrush in children's mouths, that are fed by the hand, is a terrible symptom. But in children that are tolerably

well, and at the breast, so that they are easy at the nurse's nipple, let it be ever so sore. I am never uneasy at it. If it looks very thick, I bid them rub it with syrup of mulberries, or I give them a scruple of borax in an ounce of honey to rub it with, which brings off the pellicle. The tongue, mouth and lips should be rubbed with it, and in 24 hours it will be all got rid of. But we should not be in too great a hurry. We should turn it about very gently at first, because if it is done too fast it will be very uneasy.

There is another complaint which frightened me often formerly, and that is sore eyes. There is a bad humour, so that the child cannot open its eyes and every time you squeeze them there is a great deal of matter comes away, and sometimes blood, so that now and then they are bloodshot. In these cases I used to apply leeches, poultises, etc., but now I do nothing. I only treat them as I should the red gum, or only wash them with a little breast milk, which keeps them clear and open. Thus with care they all get well, and no blindness ensues. I have seen hundreds and hundreds of children in this situation, and there was not one of them but what did well. I have took up the opinion now that they are healthy. Some children have the red gum, others sore eyes that are inflamed, and others running behind the ears. All these I look upon as natural and therefore do little to carry them off. I was once consulted about a child with an opaque cornea, which it had from its birth, I never saw yet one of this kind that did well. This could not proceed from my treatment.

*For Gripes and Fits in Children*, the common method is very well known and very proper. Only if a child is born well of a good constitution, and has a good breast, there is seldom much occasion for any medicines at all. Children have no occasion for medicines, therefore it is wrong to use them to bad habits. For the common gripings, rhoi and a little magnes. alb. is very proper. But in this town, when they have no breast, they die of gripes and watry stools, do what you will.

*As to Innoculation*, I am sure I am much distressed on this subject. I never go near a house, or room at least where they are and yet it falls in my way to know something of the innoculation of children at the breast. This practice I have attended to more particularly, and find it most successful, and all the physical people that have attended to it, such as Messrs. Hawkins, Middleton, Willmot, etc. observe the same. The common time which I find the best is about the age of 3 or 4 months, before teething. In a number of families in which I have seen it done, they all liked it, and I do not know of one that miscarried while at the breast. It may have happened but I have not heard of it. There was one lately in Red Lion Street, which was innoculated at 7 months and died, and a nobleman in Scotland had one at 8 months that died. But in both these cases it was about the time of teething.

With regard to preparation. I do not know that it answers any purpose in the world but two, to increase the appothecarie's bill, and to raise the reputation of people who have no other way of obtaining any. For the most part I believe they do very well without it, and all the physical people of my acquaintance seem to think that too much preparation is hurtful, as it lowers them too much. If a child is in good health that is the best preparation. When children are grown up to three or four years, one gentle purge may perhaps be useful. I should

be far from recommending a low diet, for they do best who are least reduced.

*Teething* generally begins about the 6th, 7th or 8th month. All that is to be done is to watch their stools. If costive, a little magnesia should be given or anything that will gently keep them open. Gentle purging is useful. If the child is loose and purges do nothing, I recommend even if they purge greatly not to stop it, but let them go on. The purging is the effect of Nature, to let them be cool and free from a fever. If they have convulsion fits, great heat, and a violent fever, I would then cut down to the teeth. And at any time when costive, give them some gentle purge. In attacks of the fever and convulsion scarify the gums.

A scabby face is a disease which often attacks children with great violence, there are great varieties of it. In general it spreads on and goes over the face and head till all of it becomes scabby. When it is thus, nothing 9 times out of 10 will cure it. 9 times in 10 it will cure itself. It often appears with the teeth, at 4 or 5 or 6 months; on the whole it is best to leave them alone, for they will get well without anything in the world. If you purge, or issue, or what you will, you cannot get it off, or if you do, it will return again. I have got private triumphs on this occasion. Physicians order shaving, setons, physick etc., for their patients, yet notwithstanding all it generally goes on till the time of teething is over, and then it does very well. As to attending twice a day and prescribing medicines in such disorders, is only paper and packthread.—

*For Weaning;* there is nothing particular. I do not know the proper time and only do not do it gradually, but all at once. Let the child suck at night for the last time. In one 24 hours the child is generally weaned. A little suck whey with barley water, the first night afterwards is the best thing in the world to be given. This makes them a little drunk, they all like it and afterwards go to sleep very comfortably. We are all carniverous animals, therefore children should be taught to eat.

*The Rickets* happen about 16 months old. If you take a child in time, and make use of the cold bath every morning, you will certainly cure him. The head and belly commonly grow large when a child is rickety, in spite of everything. Put the child into the cold bath every morning and afterwards dry it as soon as possible. Do not mind a simple eruption, little purging, slight fever, or cough; but if rickety make a constant use of the cold bath. I have seen great folly in this respect. When there has been a little rash, though not a feverish one, they have omitted it, which is very wrong. In winter time any water will do, but in summer it should be fresh, purified, from the spring every morning. A gentleman in Italy made an observation that large bellies occasioned a deviation of blood to the head, etc.

In the choice of a nurse I would particularly recommend a healthy woman, who will never suckle it when she has the catamenia. Children are often much hurt when they are suckled by women out of order, and there are some women whose milk is an absolute poison at that time. In the country whether it belongs to the bread or air, or what I do not know, but children are brought up a great deal better by the hand, than in town. Here among children of the first rank, if they have not food that is proper, the best nourishing, etc., it is the greatest chance in the world of their not dying. It is amazing what complaints are produced by bringing them up by the hand.—

Here (shewing them) are my plates of the gravid uterus. I promise myself to gain some reputation by them, as they will be of service to the world. What figures I have already seen of the gravid uterus are very bad and improperly drawn, it is a subject therefore much wanted. The women are certainly the object of your tender care. This is a subject that no one but an anatomist, and one that understands midwifery could undertake. These plates were taken from 12 different subjects so that they are exactly Nature. One of them cost 65 guineas, another 45 guineas, another 100 guineas, etc., etc., etc.

## *Comment*

The first impression one receives upon reading these lectures is that of astonishment that they should have attracted students from far and wide and that they should have retained their appeal for 36 years. They seem so gossipy and so devoid of real clinical material, and the essential facts are so briefly stated that it seems strange that Hunter's reputation should depend upon them.

In the period during which Hunter held his classes there were available to British obstetricians many complete and scholarly treatises on obstetrics: Hugh Chamberlen's translation of Mauriceau (1695) was still a standard work. Deventer's "Art of Midwifery" had been translated into English in 1746. Sir Fielding Ould's book was published in 1748, and William Smellie's great work was published in Edinburgh in 1784.

It is probable that the lectures on anatomy with the extensive dissections and demonstrations which accompanied them were the real source of the popularity attained by the course. The lectures on obstetrics were but twelve in number and evidently played but a small part in the importance of Hunter's work. It may also be that the notes taken by the student whose manuscript is under consideration were incomplete and that there is no record of such subjects as the anatomy of the pregnant uterus, which was one of Hunter's chief interests. Certainly one cannot compare the magnificent volume of plates contained in the "Anatomy of the Pregnant Uterus" with the superficial character of these notes.

Some of the views expressed are interesting, for example, he says: "Many women take a spoonful of oil at bed-time each night and they do it with the same view as we oil boots to make them supple and yielding. It does not get into the bones and produce this effect, but it keeps the body moderately open." "Whenever I am sent for to a woman taken with symptoms of purging and vomiting, which very often introduce labor, I look upon them as safe and favorable." "A little puking and two or three stools empties them and disposes them after to less fever."

There is a long-drawn out description of the conversation between the doctor and the woman in labor. After which there is a discussion of the management of labor, the chief part of which is devoted to injunctions about keeping the patient clean and dry.

After the child is born Hunter pressed upon the uterus to squeeze out the air because after the air was out the uterus begins to contract. Our author feels that the entrance of air into the vagina and uterus may produce child-bed fever. He does insist upon permitting the third stage of labor to take care of itself. Hunter is a great apostle of conservatism and prides himself upon his influence of

having some hand in the bringing of obstetrics back to Nature. Hunter says he had not used forceps in ten years, nor has he used any other instrument, saying that if he cannot get a pair of scissors to cut the naval string he must bite it asunder with his own teeth, which he has done once or twice a year.

Hunter's advice as to breech delivery is fully in accord with modern practice. He advises the greatest conservatism, and the permitting of labor to go on until the breech is delivered.

Placenta previa is dismissed very lightly. Waiting for normal labor, or, if the bleeding is too severe, he delivers immediately but does not say how.

Convulsion fits also receive but brief notice and are to be treated by bleeding and opium, with rapid delivery in severe cases. Hunter approves of craniotomy and furnishes an interesting description of the inverted uterus. Puerperal sepsis is to Hunter a very serious matter. Naturally he had no conception of the nature of the disease, feeling it is due either to cold or to the milk. He notes the occurrence of pelvic abscess and said definitely that, on autopsy, peritonitis with adhesions is found.

The remainder of the lectures deal with pediatrics. The treatment of thrush, weaning of children and so on, are of no particular interest. All in all, this is an interesting and valuable survey of the prevailing thought in British obstetrics toward the close of the 18th Century.

# Memoir of Arthur Newlin*

*By* FRANCIS R. PACKARD

ARTHUR NEWLIN was the son of Joseph Shipley Newlin and Louise Verplanck, daughter of James De Lancey Newlin, of Fishkill on the Hudson. He was born at 1018 Clinton St., Philadelphia, on September 24, 1874. After attending a small school kept by Miss Case and Miss Hallowell he went to a well-known preparatory school, the Rittenhouse Academy, and then to the University of Pennsylvania, graduating from the Arts Department in 1895, and from the Medical Department in 1899. After a brief trip abroad he began his life-long connection with the Pennsylvania Hospital by serving in it as a resident physician from 1900 to 1902. Three years later, on October 30, 1905, Dr. Newlin was elected physician to the Out-Patient Department of the Hospital and, on January 29, 1912, was appointed Physician to the Hospital, serving as such until his resignation from the active staff on December 18, 1933, when he was appointed Consulting Physician. For the last few years of his active staff service he was President of the Medical Staff.

Dr. Newlin was also for many years Physician to the Dispensary of the Children's Hospital, and Assistant Physician to the Orthopedic Hospital. He was a faithful and loyal Fellow of the College of Physicians, serving on the Council from 1922 to 1925 and for some years on the Entertainment Committee and on the Committee of the Directory for Nurses. In the latter he took the deepest interest and did much to maintain its high standard of efficient service.

Dr. Newlin was also a member of the Philadelphia County Medical Society, the Pathological Society and the Pediatric Society, and a frequent attendant at the meetings, especially of the latter, having always had a deep interest in the diseases of children.

Dr. Newlin had an honorable record of service in the World War I, serving with the Pennsylvania Hospital Unit, Base Hospital No. 10, throughout the War. The Unit left Philadelphia, May 18, 1917, and sailed from New York on the next day on the steamer St. Louis. Three days before its departure from Philadelphia Dr. Newlin had been mustered into service as a first lieutenant, and in that capacity he accompanied it to Le Treport, France, where the Unit was given charge of British Base Hospital No. 16. Dr. Newlin had the care of a very large and active medical service but remained a first lieutenant until September 9, 1917, when he was promoted to a captaincy. In October and November of that year he served as a member of a surgical team at Casualty Clearing Station No. 61 in Belgium. On October 1, 1918, he received a well-earned promotion and was commissioned a major. From March, 1918, to February, 1919, he was Chief Medical Director of the Unit, and as such returned with it to the United States and was mustered out at Camp Dix, N. J., on April 15, 1918, after having been in the service twenty-three months.

The mere recital of the events in a

* Read at the meeting of the College of Physicians of Philadelphia October 1, 1941.

man's life does but little to recall his personality and character; to give some idea of the love and esteem in which he was held by his professional associates, his numerous patients and the large circle of his friends, and to indicate his widespread influence for good in his profession, is a much more congenial task.

*Professional Work*

From the days when Thomas Bond, John Morgan and William Shippen, Jr., founded the oldest hospital and the earliest medical school, to the present day the medical profession in Philadelphia has preserved the high standard set for it by its founders, and ably continued by their successors, Benjamin Rush, Philip Syng Physick, Caspar Wistar, and others too numerous to mention, men esteemed not only for their professional skill and eminence, but for their highmindedness and personal characters; as Weir Mitchell frequently stated, they stood high in the community because they were gentlemen in the best sense of that much abused term.

Dr. Arthur Newlin was a worthy successor to this great heritage. His residency at the Pennsylvania Hospital was served under Jacob M. Da Costa, Morris J. Lewis and Arthur V. Meigs. At the Children's Hospital he worked under Louis Starr and J. P. Crozer Griffith, and at the Orthopedic Hospital he was thrown in contact with and participated in the work of S. Weir Mitchell and Wharton Sinkler. Newlin was a born doctor, possessing in the highest degree the medical instinct. This, combined with his acute mind and his capacity and willingness to work, caused many of these older men to utilize his services in his early days as a practitioner. At that time clinical laboratory facilities were not as available as they have since become and Newlin was capable of carrying out examinations of the urine and blood, and staining for bacteria for them and he also carried on much of their night work. As these older men retired or died Dr. Newlin fell natural heir to many of their former patients who had learned to value his services, and as years passed he acquired one of the largest private practices in the city. He never allowed this to interfere with his hospital duties, nor did it distract him from keeping up with the latest advances in scientific medicine. Though he published but few papers in the medical journals he was a faithful attendant at medical meetings and frequently participated in the discussion of papers read before them.

We doubt if any physician to the Pennsylvania Hospital has ever passed more hours within its wards in the course of so many years of serving it. One feature of his work at the Hospital that can never be overlooked was his care of the attaches, the resident physicians, nurses and other employees. He was looked upon by them with unbounded admiration and affection, and when sick they all wanted him to look after them. He in turn repaid their devotion by the most untiring attention to their needs.

This attitude was also an especially notable feature among the members of the Pennsylvania Hospital Unit during their service overseas; officers, nurses and men all loved him and placed unlimited confidence in his skill.

Dr. Newlin had a most acute intellect, great powers of observation and a very retentive memory. He had read widely in the best literature and though he never talked to display his learning, he could quote most aptly, and could recall whence a quotation came with remarkable quickness. He had what our forefathers called a gentle wit, never malicious or ill-timed,

but always kindly and to the point, and his delicious humor and great power of mimicry rendered him a most delightfully charming social companion. His forthright honesty never fell into the unfortunate practice of harsh criticism. Although a man of strong convictions he never uttered unkind criticisms of the faults or weaknesses of others, or spoke maliciously or with innuendo. He possessed distinct artistic talent and in his later years painted some very charming landscapes, showing real feeling and considerable ability in their execution.

Dr. Newlin's family life was very beautiful. An affectionate husband and father, I doubt if any, even of those who were overseas with him during the First World War, quite realized the depth of feeling which his long separation from his home caused him. Certainly no one could have maintained a more cheerful external demeanor or attended with more zeal to his duties. With his strict devotion to duty which I have already indicated, went an unbounded capacity for self-sacrifice. He had a very large number of patients, doctors, nurses, and others, whom he attended without any remuneration, and for whom he labored as assiduously as if they paid him the highest fees. Day or night he was at their call, and much as they loved him, they did not spare him. This was largely attributable to the fact that he carefully hid from them his own physical difficulties.

To no one could the beautiful French aphorism "Il guérit quelquefois, il soulage souvent, il console toujours" be more aptly applied.

Dr. Newlin died early on Easter Sunday morning, April 13, 1941, from an acute attack of coronary thrombosis. In him the medical profession of Philadelphia lost one of its most distinguished representatives, the College of Physicians one of its most valued Fellows, and his patients and friends a beloved guide and counsellor.

# Notes from the Library

ANOTHER INCUNABULUM

Some years ago, a non-medical Philadelphia organization which was interested in public health matters sought to stimulate civic interest in the subject by importing a well-known public-health authority to address a luncheon meeting. The distinguished gentleman arrived and went to work—with both fists, as it were, outraging those who are outraged by any criticism from a "foreigner", stimulating more pleasantly those whose sensitivity was of a less refined sort. Among the dignified institutions receiving the accolade in reverse was this College, which was summarily dismissed by the speaker as an institution whose activities were chiefly confined to a complacent contemplation of its incunabula. Naturally, this amusing allusion to a Yogi practice comes to mind whenever, as happens every two or three years, it becomes a pleasant duty to herald the acquisition of another incunabulum.

Vincent of Beauvais' (13th cent.) *Speculum maius*,[1] a section of which constitutes the omphalic object of our present contemplation, is one of those grandiose attempts by a single individual to bring together the sum of knowledge of practically every subject under the sun. Despite the defects inevitable in such an attempt, Vincent's encyclopaedia has been called "one of the greatest monuments of learning of the Middle Ages".

In its printed versions the *Speculum maius* is divided into four component *specula*, dealing respectively with nature, doctrine (learning), morality, and history. (The *Speculum morale* is now believed to be the work of a later compiler.) Our collection has contained a copy of the *Speculum naturale*,[2] "an account of natural history in the form of a gigantic commentary on Genesis I", since 1901. Until now there has not been available anywhere in the Philadelphia area the text of the (to us, most important) 'practical' part of the encyclopaedia—namely, the *Speculum doctrinale*, or *Mirror of learning*. The cultural resources of this community are, consequently, greatly enriched by the addition of a copy of Koberger's superb 1486 Nuremberg edition of this *speculum*,[3] which has come to us as a gift of the Woman's Medical College of Pennsylvania, through its Dean, Dr. Margaret D. Craighill, in souvenir of its first Commencement held in the Hall of this College, June 11, 1941. The only other copy of this edition in this country, incidentally, is in the famous Huntington Library, in California.

Divided into 17 books, 2374 chapters (Sarton), the *Mirror of learning* "is a summary of theoretical and practical knowledge arranged in six major groups: literary, moral, mechanical, physical,

[1] On Vincent and the *Speculum maius*, see Lynn Thorndike, *A history of magic and experimental science*, vol. 2, pp. 457–476 (New York, Macmillan, 1929); George Sarton, *Introduction to the history of science*, vol. 2, pt. 2, pp. 929–932 (Baltimore, Williams & Wilkins, (1931)).

[2] *I*[*ncunabula in*] *A*[*merican*] *L*[*ibraries*] V263 [Strassburg: The R-Printer (Adolf Rusch), not after 1478]. Klebs 1036.1.

[3] IAL V251. Klebs 1037.2.

mathematical, theological. . . . It deals with such subjects as grammar, logic, husbandry, law and government, various trades, medicine (456 chapters), physics, mathematics . . . astronomy, astrology, music, weights and measures, surveying. It even includes a dictionary (c. 3200 words)."

The medical books of our new "mirror" of the mediaeval arts and sciences have been studied to some extent by Alexis Rieunier in his Paris medical thesis.[4] Rieunier gives as Vincent's medical sources, Galen, Pliny (both elder and younger), and, more particularly, the Arabians Avicenna and Rhazes. The medical chapters form the substance of the 12th, 13th, and 14th books. They are commented upon by Rieunier under the following subject-headings: Hygiene; Treatment of diseases; Treatment of leprosy; Eunuchs; Anatomy and physiology, qualities of the various parts of the body. Heat, cold, humidity, dryness; Dreams from the point of view of the constitution; The three *spiritus*, natural, vital, animal. Physiology of the brain. Localization; Digestion; Some diseases. The itch. Phthisis; Surgery (Rieunier says that Vincent has little on this subject); Remedies; General considerations.

Rieunier's "Conclusions" proceed as follows: I. The *Speculum* is an important work from the point of view of the history of medicine in the middle ages. II. Its anatomical indications and its physiological explanations are generally erroneous. III. Side by side with bizarre treatments are certain indicated medications of genuine value. IV. The symptoms and external phenomena of diseases are generally indicated accurately. V. As regards the meaning of the word *scabies* in the middle ages, there is to be noted an interesting passage which proves that the itch was comprised in the skin affections to which the word *scabies* was applied. VI. Nothing was found in the work which could be applied to syphilis.[5] . . .

It will be obvious, even from this brief note, that the College in particular, and the community in general, have, in this *Speculum*, acquired a first-rate source-book for the study of the arts and sciences in the middle ages. The mediaeval encyclopaedists "have less originality than our own medical authors, if that is possible, but they render a service to history by their résumés and they aid in fixing the limits of certain epochs; they are furthermore often the echo of lost books or doctrines which time had already thrown into obscurity" (Daremberg, cited by Rieunier). It is well to add that Rieunier's thesis suggests itself as having by no means exhausted the possibilities of profitable study of the résumé of mediaeval medicine to be found in the *Speculum doctrinale* of Vincent of Beauvais.

### GERARD OF CREMONA'S TRANSLATION OF GALEN'S DE CRISIBUS: A 13TH CENTURY MANUSCRIPT

We fall easily into the error of imposing on a printed text a sort of divine authority. But not every worthy manuscript written on a given subject arrives at canonization by means of print. Not every manuscript that achieves this consummation arrives at it undefiled by the many hands through which it has passed, some of them perhaps unlettered, care-

[4] Alexis Rieunier, *Quelques mots sur la médecine au moyen-age d'après le Speculum majus de Vincent de Beauvais (XIII^e siècle)*. Paris (Thesis), 1892.

[5] It will be noted that most of these conclusions apply, and are commonly applied, to mediaeval medicine generally. A profitable study of the medicine of this period seeks to uncover the reasons behind the obvious incongruities, to reconstruct the set of conditions which governed precisely the nature of the work under consideration.

less, arrogant. Thus it is that experienced historians, to whom one printed word is not necessarily as good as another, seek manuscripts, to uncover both unknown texts relative to their field of interest, and known texts which, through variations from printed versions and from other manuscripts, may help to clear up doubtful readings and, in general, aid in establishing the most authoritative text possible.

Compared with our collections of early printed editions, our collection of mediaeval and renaissance medical manuscripts is not impressive; compared, however, with similar collections in this country, its dimensions are not quite so insignificant. Though the 3-volume De Ricci and Wilson *Census of medieval and renaissance manuscripts in the United States and Canada*[6] is witness to the large amount of manuscript material of this period now available on the North American continent, the number of significant medical manuscripts is, on the whole, not very great. According to the *Census*, of the medical libraries owning such manuscripts, the Osler Library, in Montreal, would seem to lead the field, with 25 manuscripts, while the Boston Medical Library, with 25 is not far behind. The Cushing collection, now at Yale, numbers 12, a figure matched by both the Army Medical Library and the library of the New York Academy of Medicine.

Of the eight manuscripts accredited to us in the *Census*, probably the most notable is a 14th century Bernardus de Gordonio *Lilium medicinae* thought to have been written at Oxford. This was bequeathed to the library by Sir William Osler and has several times been consulted by scholars in the past few years. The other manuscripts include a 14th century Arnaldus de Villanova *Regimen sanitatis*; a 13th century *Viaticum Constantini*, to which is appended the *Antidotarium* of Nicolaus Salernitanus (referred to in this place in our last issue); a late 15th century *Macer floridus*; Aegidius Columna's *Regimen regum et principum* (14th century); Baptista Massa's *De fructibus vescendis* (15th century?); the *Tractatus de cura sterilitatis mulierum* of one R. de Apiemis (or Apientis?) (ca 1400); and an anonymous *Secreti medici* (14th–15th centuries). Since the cultivation in this country of collections of medical manuscripts has been of slow growth, it need hardly be said that for the most part these are the only manuscript versions of the texts available in the United States and Canada.

To this slender list of manuscript source-material we have recently added a 13th century manuscript of Galen's *De crisibus*. We quote a description of the manuscript supplied by its former owner, Dr. Bertalot, of Rome, who entrusted it to Professor Dean P. Lockwood, of Haverford College, for sale in this country on the latter's return from Italy: "manuscript on vellum with initials in red and blue at the beginning of the three books. 2 columns. 31 leaves (24 x 16 cm.). The MS is carefully written in the XIIIth century probably in Italy, complete and well preserved in a modern half calf binding.

"The text is the latin translation by Gerardus Cremonensis and generally agrees with the printed edition in 'Primi voluminis Galeni quinta impressio (')'. Venetiis (Giunta) 1522, f. 239–258."

We feel that the particular importance of this manuscript attaches not so much to the name of Galen as to that of his translator. At least two mediaeval or early renaissance translations of the *De crisibus* are known—that of Gerard of Cremona (12th century), and the later

[6] New York, H. W. Wilson Co., 1935–40.

one of Nicolaus Leonicenus (1428–1524). Presumably because it was made during the period when the ancient texts were first being printed, and was thus a 'modern' interpretation, the translation by Leonicenus is the one most frequently found in printed editions of the text. This library, for instance, does not have the Giunta edition of 1522, but has the Leonicenus translation in several editions. The De Ricci and Wilson *Census* lists manuscripts of some twenty-four Galen texts, but none of the *De crisibus*. Thus the new manuscript supplies us with our only text of the Gerard translation, and the American world of scholarship with its only mediaeval manuscript of this work.

It is evident that this library, like others, has not in the past extensively cultivated the acquisition of mediaeval and renaissance medical manuscripts. American scholars in general have long expected to travel to Europe for the investigation of manuscripts essential to their studies. The *Census* shows, however, that a strong migration of this material to these shores has been in progress for some time. It will doubtless become stronger after the war. Therefore, when an opportunity is offered to obtain a manuscript which patently belongs in a research medical library, and which would add to the community's cultural resources, we shall not willingly pass it by—especially in an age when 'Censuses', union library catalogues (and "Notes from the library") exist to herald its presence in the library, and when photostats or microfilm are at hand to make it available in effigy to distant Mahomets.

W. B. McD., 2d

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# The Role of Acid Gastric Juice in Gastric and Duodenal Ulceration*

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## INTRODUCTION

ON THE first day of August, 1825, in the frontier outpost of Fort Mackinac in Michigan Territory, an obscure United States Army Surgeon carried out some simple experiments on the stomach of an injured French Canadian trapper. Pieces of pork and boiled beef together with other articles of diet were suspended in the stomach by a string and upon examination two hours later were found to have been digested (1). William Beaumont's observations and experiments on Alexis St. Martin constitute a landmark in the study of gastric physiology. Beaumont, however, was not the first to perform such experiments. Réaumur (2), in 1752, had shown that meat introduced into the stomachs of buzzards underwent dissolution. In 1777 (3), Stevens of Edinburgh, in his Inaugural Thesis, showed that the human stomach contains a fluid capable of digesting tissue, and also that pure gastric juice will dissolve meat in vitro. In 1823 William Prout (4), speaking before the Royal Society of London, proved that gastric juice contained free hydrochloric acid. The credit, however, for the discovery that the gastric juice contains an acid really should be given to John R. Young (5) of Maryland who, on June 8, 1803, submitted a dissertation entitled "An Experimental Inquiry into the Principles of Nutrition and the Digestive Processes" to the faculty of the University of Pennsylvania. In this dissertation for the degree of Doctor of Medicine, Young showed clearly that the gastric juice of the frog and also of man turns litmus paper red. Chemical examination showed a great similarity in the behavior of gastric juice and phosphoric acid. Beaumont, early in his work, satisfied himself of the presence of free muriatic acid and also showed that dilute hydrochloric acid does not possess the

* Thomas Dent Mütter Lecture LIV, The College of Physicians of Philadelphia, December 3, 1941.

digestive power of gastric juice. Theodore Schwann (6), in 1835, discovered the proteolytic enzyme, pepsin.

In 1772 John Hunter (7) wrote an article "On Digestion of the Stomach after Death" and concluded that "the stomach, being dead, was no longer capable of resisting the powers of that menstruum, which itself had formed from the digestion of its contents." The theory that the ability of the stomach to resist digestion is an inherent property of the living cell persisted for three quarters of a century until Claude Bernard (8) showed his students that the legs of a living frog introduced into the stomach of a dog through a fistula, underwent digestion. Bernard had this to say:

> It is claimed that life puts an obstacle in the way of the chemical reactions which can take place outside the living individual. . . . This is doubtless true, but it is not an explanation. . . . If gastric juice does not digest the walls of the living stomach, it is because during life pepsin cannot be absorbed.

This explanation, depending as it does upon the concept of the impermeability of the epithelium to pepsin, does not satisfy us today. However, the purpose of the present paper is not so much to inquire into the mechanism by which the stomach resists digestion as it is to consider the role of this digestive property of the gastric juice in ulceration in tissue exposed to its action.

### GASTRIC SECRETION

The human stomach is not unique in its ability to secrete acid gastric juice; on the contrary, this property seems to be possessed by the stomachs of all vertebrate animals and indeed, by those of many lower species. The mechanism of its secretion is not known. Under optimum conditions gastric juice apparently is secreted with an initial acid concentration of about 160 milli-equivalents or clinical units and a *p*H somewhat less than 1.0. The composition of the fluid varies with the rate of secretion (9). The total amount secreted is unknown, but there is indirect evidence that in the average normal adult it is at least 2500 to 3000 cc.

The clinical methods available for measuring gastric secretion are all more or less unsatisfactory. The old Ewald and fractional gruel meals are notoriously unreliable. The histamine test is probably the most satisfactory procedure, for histamine is the most potent stimulus of gastric secretion known. The test indicates apparently the secretory ability of the gastric glands, but it does not indicate the actual amount of gastric juice secreted during the day and night in response to the ingestion of food or in fasting. Technical errors may occur in this test, as in all laboratory procedures. The tip of the tube, for instance, may be in the esophagus or duodenum rather than in the stomach. Furthermore, marked variations are occasionally encountered from time to time in the response of a given stomach to histamine.

The normal stomach may exhibit almost any type of histamine curve. In other words, there is no such entity as hyper- or hypochlorhydria. Even complete achlorhydria seems, in a sense, to be within the limts of normal. Extensive studies of gastric secretion in disease have shown that only two definite and constant relationships exist; namely, the regular absence of acid gastric juice in pernicious anemia, and its regular presence in peptic ulcer. In terms of response to histamine, peptic ulcer may be found with almost any secretory curve except persistent achlorhydria. It is important to note, however, that as a rule the basal secretory rate is very high in duodenal and jejunal ulcer and also in gastric ulcer,

as shown by Winkelstein (10), Bloomfield (11), and numerous other investigators.

### THE PATHOGENESIS OF PEPTIC ULCER

The pathogenesis of peptic ulcer has been vigorously debated for the past hundred years or more. Virchow and Rokitansky (12) attributed the lesion to vascular occlusion, infarction, and subsequent digestion of the infarct. Konjetzny (13), Puhl and others, however, have shown that ulcer is a penetrative process, that it begins in the mucosa and invades the wall of the stomach or bowel. These workers have traced the complete transition from an acute erosion to an acute ulcer and thence to a chronic ulcer. This concept is completely in accord with clinical experience, for almost everyone has observed patients with chronic lesions who suddenly experience acute perforation of an ulcer or massive hemorrhage, thus giving evidence of the extension of the lesion. Roentgenologic and gastroscopic proof of the progressive increase in the size of an ulcer has been presented by Berg (14) and by us (15). Peptic ulcer in the human is clearly a penetrative invasion process beginning in the mucosa.

Experimentally, typical peptic ulcers may be produced in various ways. The most satisfactory procedures are those which interfere with the normal neutralization of acid in the intestine. Thus Mann and Williamson (16) found that transplantation of the bile and pancreatic ducts to the ileum or drainage of the duodenal content into the ileum resulted in the formation of duodenal ulcer. Matthews and Dragstedt (17) anastomosed a Pavlov paunch with a blind loop of ileum, thus allowing the mucosa of the ileum to be exposed continuously to the action of unneutralized acid gastric juice. Ulcers regularly developed. Wangensteen (18) and his associates produced a continuous hypersecretion by means of the intramuscular injection of a mixture of histamine and beeswax and obtained typical perforating "peptic" ulcers. In experimental ulcer, therefore, one fact seems inescapable, namely, the absolutely essential role of unneutralized acid gastric juice.

From the clinical standpoint, peptic ulcer occurs only in those portions of the digestive tract exposed to the action of acid gastric juice. The well-known ulcer of Meckel's diverticulum and the rare solitary ulcer of the small bowel have both been shown to occur adjacent to aberrant, acid-secreting gastric mucosa. Furthermore, chronic peptic ulcer occurs only in those stomachs able to secrete acid gastric juice. This statement requires amplification because of the frequent allegations to the contrary. Such assertions are practically all based upon case reports which are unsatisfactory because the evidence of persistent achlorhydria is totally inadequate. In 1926 (19) I reviewed over a thousand cases of ulcer without finding satisfactory evidence of the existence of active ulcer with complete achlorhydria. The search for such a case has been continued ever since. Last year Dr. Nutter and I (20) reported a series of 84 cases of gastric ulcer in some of which the gastric secretion was low but in none of them was free acid completely absent. In one instance the highest histamine free acidity found was 18.

A penetrating ulcer of the lesser curvature has been seen recently with a maximum histamine free acidity in several tests of 13 and a minimum *p*H of 2.75. The crater decreased rapidly in size during hospitalization and the administration of a bland diet. Sudden death from coronary occlusion occurred five weeks later. Autopsy disclosed luetic aortitis

and complete healing of the ulcer. Another patient with a large penetrating ulcer and a good histamine free acidity in 1937, for some reason developed a marked reduction of her gastric secretion in 1938. Since then a shallow gastric ulcer has been seen occasionally and at times roentgenologically also, although with great difficulty. The gastric secretion has remained low, but not achlorhydric. It seems clear, then, that chronic peptic ulcer may occur with very low grade gastric secretion. The significance of such hydrogen ion concentrations in the pathogenesis of peptic ulcer will be discussed later.

Rodgers and Jones (21) have described a type of acute or subacute ulcer, 2 to 5 mm. in diameter, found by gastroscopy only in the presence of a "thin, atrophic mucosa and associated with absence or diminution in the secretion of acid." These authors state, however, that they have never seen "large chronic gastric ulcers in patients with a uniformly thin mucosa and either a low acid curve or achlorhydria." Kahn (22) failed to find a single peptic ulcer in 840 cases of pernicious anemia and Washburn and Rozendaal (23) likewise failed in 906 consecutive patients with the same disease. It thus appears that while perhaps small acute or subacute ulcers may occur with complete achlorhydria, these lesions disappear promptly, and the typical chronic peptic ulcer occurs only in the presence of acid.

The pathogenesis of peptic ulcer seems, therefore, in summary, to consist of the failure of the mucosa to withstand the necrosive and digestive attack of acid gastric juice. In understanding this phenomenon, it must be borne in mind that the hydrogen-ion concentration of the blood serum and of the body cells approaches neutrality, the *p*H being approximately 7.4. Chronic ulcer is invariably associated with an acid gastric secretion, usually with a *p*H below 2, occasionally with a *p*H between 2 and 3. In the gastric lesions described earlier with a low secretory curve, the *p*H was 3.0 or lower. Pepsinogen is activated to pepsin in such solutions and remains active until the *p*H is raised to 5.0. In view of the susceptibility of tissue cells in general to relatively slight changes in the *p*H of the environmental fluid, the resistance of the normal mucosa to digestion seems even more remarkable than John Hunter thought it to be. It is not at all surprising that at times localized digestion does occur. The conditions responsible for the process may be variable. Perhaps one of them is an excess of acid acting for an abnormally long time, as is suggested by the frequently observed excessive night secretion. Perhaps, for some unknown reason, the cellular resistance is lowered. Little is known of the mechanism of cellular resistance. Many facts could be cited to show that tissue cells vary greatly from individual to individual in their ability to proliferate, regenerate, and withstand an unfriendly environment. Mention should be made also of the protective role of the thin layer of mucus covering all of the epithelial cells of the digestive tract. Ivy and Whitlow (24) found many years ago that when this layer of mucus was wiped or rubbed away, the underlying cells were easily injured by the application of acid gastric juice or of other acid solutions. It is entirely possible that in peptic ulcer the loss of this layer for a few minutes, resulting perhaps from the friction of food, is sufficient to allow the destruction of a few of the surface cells and thus initiate the "acid attack."

In certain cases of gastric carcinoma the cells of the tumor seem to be quite

susceptible to peptic digestion. The resultant lesion may be indistinguishable morphologically from benign peptic ulcer. Ewing (25), Wilensky and Thalhimer (26), and others have described instances in which no evidence of carcinoma was found in an ulcer and yet metastases were present in the lymph glands. These observations were interpreted as showing that the original growth had been completely destroyed by digestion. This interpretation is supported by various bits of indirect evidence. For instance, in a case (27) of rapidly metastasizing tumor (Jarcho) the pathologist at autopsy considered the gastric ulcer to be benign even though extensive metastases were obviously present. The lesion possessed many of the characteristics of a benign ulcer, yet it seemed obviously to have been primarily a carcinoma. A histamine free acidity of 106 had been demonstrated in the gastric content. There was also definite evidence of healing. Neoplastic ulcer may simulate benign ulcer in structure and, to a limited extent, in its capacity for healing. Thus in another case, the crater as seen by x-ray decreased markedly in size. Upon histologic examination of the resected specimen the base of the ulcer was found to be markedly fibrosed and almost entirely covered with a newly proliferated epithelium. The lesion, however, was a carcinoma and apparently had been one from the beginning. Abundant acid (histamine free acidity 50) was found in the gastric secretion. The evidence of partial healing seen in such lesions and their general structure thus suggest that acid digestion plays a role in the formation of the ulcer.

### THE MECHANISM OF ULCER PAIN

The concept elaborated thus far has been such as to hold acid gastric juice responsible to a large extent for the initiation of an ulcer and for its progression. The inflammation is interpreted as a chemical inflammation—the response of tissue to an extremely unfavorable and indeed, lethal hydrogen-ion concentration. There is also abundant evidence that the same process is responsible for the production of pain in peptic ulcer (28). In a patient with a sensitive lesion, the pain of ulcer may be relieved by emptying the stomach and it may be made to reappear by reintroducing into the stomach the aspirated gastric contents. This pain in turn may be relieved promptly by any measure which neutralizes the acidity of the gastric content. Similarly the pain may be caused to reappear by injecting into the stomach perfectly physiologic concentrations of hydrochloric acid or indeed, of other acids. The pain produced may come immediately or it may be delayed; it may be mild or very severe. The pain of ulcer is definitely not the result of pylorospasm or gastrospasm or of abnormal peristalsis although in a sensitive lesion the pain threshold may be crossed by such stimuli. The pain arises in the ulcer itself and seems to result from acid irritation of the nerve fibers, known to be present in large numbers in the base and in the edges of an ulcer. The acid milieu is thus responsible for the origin and extension of the lesion; it is responsible for the lowering of the normally high pain threshold of these nerves, and it constitutes the stimulus adequate for the production of pain. This is not surprising when it is recalled that Moore (29) and his associates found that solutions as weakly acid as *p*H 6.0 produced painful stimulation of the nerve endings in blood vessels and capillary loops. In peptic ulcer, the *p*H of the gastric content at the time of pain is usually enormously lower than 6, being as a rule less than 2.0.

THE HEALING OF PEPTIC ULCER

The majority of ulcers heal spontaneously. Recurrent ulcers may form later at the same site or elsewhere. In every ulcer there is a basic conflict between healing and necrosis. The delicate balance between those two processes is easily tipped one way or the other, leading either to more or less complete healing or to further extension. Whether or not the remissions, the healing, and the recurrences are related, wholly or partially, to variations in gastric secretion is not known. Brown and Dolkart (30), as well as other investigators, have not been able to find any differences in secretion, as measured by standard test meals, between the periods of remission and those of activity. This does not settle the question, however, for the test meals, as mentioned previously, do not measure the basal or nocturnal secretions considered by some workers to be of paramount importance. It is entirely possible that the total secretion may be increased during or prior to the phase of reactivation.

Reactivation and healing cannot be correlated in any absolute sense, however, with gastric secretion. Some ulcers occur and fail to heal with low acid values, whereas others heal rapidly in an acid milieu. This is true both clinically and experimentally. These variations may have several explanations. In part they may be due to the location of the lesion and the mechanical injury resulting from friction. In part the variations may represent differences in the regenerative capacities of the tissues, for such individual differences in tissue repair are well recognized. The whole problem of healing may perhaps be summarized in the concept of relative tissue resistance and regenerative power on the one hand and relative destructive force on the other, the destructive force depending chiefly upon the concentration of acid present and the duration of its action.

If this position is valid, one would expect that healing will occur more rapidly and more surely when an ulcer is completely protected from the action of acid gastric juice. Conclusive experimental proof is difficult to obtain in the human for self-evident reasons. It is extremely difficult, if not impossible, to keep one ulcer constantly bathed in an alkaline or neutral medium for a significant period of time and to keep another ulcer similarly bathed in an acid medium. In the experimental animal this procedure can, and has been, carried out with completely conclusive results. Some years ago I (31) endeavored to obtain clinical evidence on this point by subjecting two comparable groups of hospitalized patients to programs of therapy differing only in that alkali was administered to one group in large amounts whereas beef extract was given the other group as a substitute for the alkali. The design, of course, was to neutralize the gastric acidity in the alkali group and to stimulate gastric secretion in the beef tea group. One of the difficulties encountered was that of measuring the rate of healing. It was felt that a fair criterion would be the rate of disappearance of spontaneous pain and the rate of desensitization of the pain-mechanism to the acid test. Subsidence of the inflammatory reaction is probably the first step in the healing process. The experiment was not ideal because in the alkali group complete neutralization was not obtained due to failure to control the night secretion, and conversely, in the beef tea group stimulation of the gastric secretion was not maintained throughout the twenty-four hour period. Hence the experiment did not produce the complete contrast desired. The results, however,

were of great interest. The average duration of spontaneous pain was 2.8 days in the alkali group, 26.6 days in the beef tea group; the average duration of sensitivity to the acid test was 9.7 days in the alkali group, 26.9 days in the beef tea group. It thus seems clear that neutralization of the acid facilitated the process of healing.

As further evidence on this point, I might cite the regular healing of duodenal ulcer following gastro-enterostomy and especially following Finsterer's resectio ad exclusionem. Furthermore, in our experience with radiation therapy (32), healing of the ulcer has invariably been seen in those patients in whom achlorhydria developed. Recurrences, of course, do occur after the return of acid secretion. The difficult ulcer patients are almost invariably those with high grade acid secretions. It seems, therefore, as Sippy (33) wrote years ago, that "the greatest known hindrance to the healing of peptic ulcer that is amenable to medical or surgical control is the disintegrating and digestive action of the gastric juice." If it were possible to obtain a complete and permanent achlorhydria, the ulcer problem would be solved. Whether or not other problems would arise remains to be seen.

### TREATMENT OF PEPTIC ULCER

In the treatment of peptic ulcer, the prevention of recurrent ulceration is a much more difficult problem than is the healing of the initial lesion. This is due presumably to the fact that adequate neutralization or inhibition of secretion cannot be maintained indefinitely.

*Medical:* The various methods of medical treatment of peptic ulcer are well known. The recognition of the importance of rest in gastric disease antedates modern medicine. There is evidence that physical rest, and indeed, even mental rest facilitates wound healing. The use of milk also dates back to antiquity. It is an excellent antacid for it will neutralize more than its own volume of 0.3% hydrochloric acid. Indeed, all protein foods possess splendid neutralizing value, a capacity utilized consciously or unconsciously in most of the frequent feeding programs. The origin of the use of alkali in the treatment of ulcer is also shrouded in antiquity, hidden, perhaps, by the chalk cliffs of Dover. In any event, calcium carbonate and magnesium carbonate seem to be the most satisfactory forms of alkali, although various other salts such as aluminum hydroxide, aluminum phosphate, and magnesium tricalcate are very satisfactory.

Inhibition of gastric secretion is difficult to accomplish. Atropine does diminish the volume, but the dose required to reduce the free acidity cannot be used clinically because of the unpleasant side effects. Various extracts capable of depressing gastric secretion have been prepared, such as enterogastrone and urogastrone, but thus far none of them have been available to us for clinical study. Metz and Lackey (34) used powdered posterior pituitary extract administered by nasal insufflation with "excellent results." Experimentally pituitary powder does produce an intense vaso-constriction in the gastric mucosa and a marked drop in secretion, but we have not been able to obtain this result in therapeutic doses in man. Roentgen irradiation directed at the fundus of the stomach usually depresses gastric secretion if given in adequate amounts. The effect, however, is variable in degree and in duration.

*Surgical:* The indications for surgery in peptic ulcer arise, in essence, from its complications, the most urgent, of course,

being acute perforation. Subacute and chronic perforations are not absolute indications for operations nor are "penetrating ulcers" necessarily surgical. In a pathologic sense, all ulcers are "penetrative." It is a common experience to observe the rapid healing under medical management of deeply penetrative gastric, duodenal and jejunal ulcers. Massive hemorrhage is a complication best treated medically as a rule, although in selected cases surgical attempts to tie off the bleeding artery or even excise the lesion may properly be elected. In certain instances of recurring massive hemorrhage subtotal gastric resection in an interval between episodes of bleeding may be desirable. However, even subtotal gastrectomy does not guarantee against recurrent massive hemorrhage. The most frequent indication for surgical treatment is stenosis. The type of operation to be chosen depends upon the circumstances present. Gastro-enterostomy and gastro-duodenostomy regularly result in the healing of the original ulcer, but recurrences occur in our experience in about 40% of the cases. Partial gastrectomy has a higher incidence of permanent cure and a higher mortality rate. The great difficulty with subtotal gastrectomy for duodenal ulcer is the fact that the recurrences, when they do develop, are much more difficult to treat both medically and surgically than is the original lesion. Gastric ulcer, in contrast to duodenal ulcer, may apparently be resected with relatively little risk of recurrence. The explanation of this difference is to be found probably in the fact that the average secretory rate is higher in duodenal ulcer than in gastric ulcer and the incidence of post-operative achlorhydria consequently is lower. Subtotal gastrectomy is the only procedure that produces persistent achlorhydria, but it does not do so regularly or consistently.

## SUMMARY

In this paper I have endeavored to show that not only is the dead stomach not capable, as John Hunter said, of resisting the digestive powers of the gastric juice, but that under certain conditions, the living stomach also is incapable of completely resisting digestion. Peptic ulcer results from this process. The initial steps are not clear, but the evidence suggests that slight mechanical injury such as the loss of the protective layer of mucus as a result of the friction of the chyme may be sufficient to allow a localized cellular necrosis with the formation of an erosion. The development and extension of the lesion, the pain, the chronicity, and the failure to heal all may be attributed basically to the destructive effect of acid gastric juice. The same process may take place in a neoplasm, producing a lesion grossly indistinguishable from benign ulcer and possessing many of its essential characteristics. Theoretically the perfect treatment of peptic ulcer would be the production of a complete and permanent achlorhydria. This goal as yet is not attainable, and if it is attained, new difficulties may arise.

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# The Heart That Is Ageing*

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BEFORE I proceed to the technical and scientific section of this presentation, I would like to say a few words concerning the man for whom this Lectureship was named, and I should like to mention the motivations behind the endowment of this Lectureship. Of the latter I shall speak first. It was my father's idea thirty-some years ago, when the endowment of this Lectureship was provided for in his will, that the general practitioner was often a neglected man in the proceedings and meetings of scientific medical organizations. He felt that the greater number of papers that were read had to do with investigative work and the minutiae of clinical studies which had very little practical value for the man in the field. His concept of the average medical society program holds good to the present day, but on the other hand, as illustrative of his vision and of his ability to foresee the need for continued medical education, I might state very generally now it has come about that the general practitioner is being well taken care of at special medical meetings arranged primarily for him; and in the field of medical education, extension courses have been and are given here, there and everywhere, largely for the man who is not a specialist but one who comes in contact with every day disease and with the person sick in a family. One can witness the tremendous growth of graduate teaching as evidenced by extension courses given by state and county medical societies, by university medical schools and often financed by foundations such as the Commonwealth Foundation. One knows that there are innumerable so-called graduate assemblies available to the physician who does general work, and these are appreciated; some of them are so large that at their yearly meetings there will be three to four thousand doctors in attendance. This Lectureship specifically is to be given for the family doctor, the general practitioner, the physician who sees innumerable diseases and varied expressions of bodily disorders. As a rule, he is so busy and so active that it is with difficulty he can keep up with the broad fields of medicine.

In the preparation of this paper I have tried to keep the wishes of the donor of the Lectureship in mind and to present a subject which will be of broad interest and not a discussion of some of the finer details of diagnosis, of the refinements of therapy or description of new, detailed and unusual technics in the field of diagnosis and treatment. I hope that the future lecturers will adhere to the wishes of the founder of this Lectureship.

Now a few statements concerning the man for whom the Lectureship was named. Dr. Benjamin Musser was a country practitioner in the little town of Strasburg, Pennsylvania. He was a Pennsylvania Dutch boy whose forefathers came from the Swiss Palatinate and settled in Lancaster County in 1705; the son, grandson and great-grandson of a physician and the blood relation of

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innumerable other Drs. Musser. Dr. Benjamin Musser was a graduate of Jefferson Medical College. I have in my library notebooks in which he kept his notes of the lectures when he was a student. They show that the notes of the medical student of that day, 1843, and of the doctor, differed but little from the medical notes taken today, as illustrated by the fact that his notebook is replete with prescriptions. Many of these preparations are no longer used but many of them bear a striking similarity to the medicines we use today; syrup of rhubarb and senna, black wash, salicylic acid ointment, saturated solution of potassium iodide, Blaud's pills and many other pharmaceutical preparations and prescriptions familiar by name and use to the present day physician.

In reviewing his old notebooks, it is interesting to read what Mitchell said on November 20, 1843, in the old amphitheater of Jefferson College, relative to typhus fever. I mention typhus fever because of the present day interest in the disease and because in contradistinction to typhoid fever which occupies many pages of notes, to typhus fever there is given but one page. "Epidemical disease—quite young subjects are exempt from this disease—the age most liable to attacks is from 15 to 25, and in this age it is that the prognosis is most commonly unfavorable, from 30 to 35 it is not of so frequent occurrence and the prognosis is more favorable—it attacks all ages from 12 to 100 years—those who have lived long in the country where it makes its appearance are more liable to attacks of it than strangers, it is considered to be contagious. Terminates from the 5th to 15th and 20th day—remission generally on the 3d and 13th days with a marked exacerbation—odor from the patient's body ammonacel or he says it resembles the smell characteristic to negroes, diarrhea after the 7th day—warm produces diarrhea and cold the contrary effect—dark red spots on the back, groins and limbs on the 4th day—they are not changed in appearance on pressure. Sudamenia are very rare, no constant lesions, although we may have congestion—second attacks are frequent—much more malignant than typhoid—great cephalic disturbance—epidemic most in poverty—chillings—prostration of strength—diarrhea after the 5th day—4th day an eruption on the skin—dingy dirty appearance—a few days after a black spot takes the place of the purple (exhemosis) hemorrhages occur, nose, bowels, throat, stomach, lungs—age most favorable 30 to 35 years."

This is, it is true, but a brief sketch of typhus yet many of the observations have remained unchanged from 100 years ago.

After graduating from the medical school, Dr. Benjamin Musser went to the small town of Strasburg which, for nearly 100 years, has remained static in its population. The town of today has just about the same number of people as it had in 1845. The house that Dr. Musser used as his office and residence is still standing. In this home was born John Musser.

Dr. Benjamin Musser's practice took him into the surrounding lush countryside of Lancaster County. He had long drives to make with his horse and buggy and his horses had become so well trained that, like many another hard working country practitioner in pre-automotive days, he would fall asleep on the return trip and the horses, without guidance, would return to their home stables. Dr. Musser was a Mennonite and for many years he was a Bishop in this church, performing his sacred duties on Sunday morning; his secular activities he

carried out Sunday afternoon and week days and nights. He was an extremely busy and active man and died in his middle fifties, expiring as result of a sudden heart death which, in the light of our present day knowledge, undoubtedly was coronary occlusion. He is buried in the little country cemetery behind the Mennonite church at Wheatland Mills, some four miles from Strasburg.

I will now proceed with the subject of my address, the heart that is growing old. In the past 100 years there has been a marked extension of life expectancy. In 1850, Dublin has shown, more than half of the people of this country were under 20 years of age; that in the regular census of each decade the percentage has gradually fallen so that in 1900 the younger group represented slightly under 45 per cent of the population; in 1930 they were 39 per cent and in the census figures recently released the percentage of young people to the population as a whole has dropped to 36.7 per cent. It is obvious why this percentage of young people has dropped. The mother of the child is watched over carefully and given prenatal care. After the infant is born, postnatal care is assiduous and attentive. Personal hygienic measures have been instituted and are being followed which make for a relatively sound and sensible way of living. Public health measures have been of inestimable value in controlling the epidemics of contagious and infectious diseases. The campaign against tuberculosis has resulted in a marked decline in the death rate from this once scourge. The institution of chemotherapeutic agents capable of curing the most prevalent of all infectious diseases, syphilis, has brought about a material decline in the deaths from the late effects of this disease. It is too early yet to state that the new chemotherapy of the last few years will have statistical significance in the reduction of the number of deaths per year, but this undoubtedly will be true. Chemotherapy will mean an additional factor responsible for prolonging life's span. Other therapeutic measures, the use of insulin and other glandular products, the achievements of surgery, the more prompt and early diagnosis of disease, all also play an important role in life's drama; the actors are becoming aged; they would have made their final exit at an early age had they lived 100 years ago.

As a corollary that as the percentage of young people dropped, the percentage of old people showed a marked increase, that is, old people who have passed the age of 65. In 1850, 2.6 per cent of the population obtained this age, in 1900 it was 4.1 per cent and in 1930 the percentage was approximately 6. It has been estimated that by 1980 at least 15 per cent of the total people of this country will have reached or passed the age of 65, twenty-two million people approximately, instead of the three million of 40 years ago.

A hundred years ago people were dying of infectious diseases, of diabetes, cancer; nowadays they die as result of degenerative changes that are a natural evolution in the life of any animal. These degenerative changes, as all doctors and the educated, well informed laity know, involve chiefly the cardiovascular system, essentially the vascular system but with expressions at the time of death which may be primarily in the heart or the kidney or the vessels of the brain. Again to quote Dublin, who shows that a child at its birth will have 45 chances in 100 of dying because of cardiovascular renal disease; a man at the age of 30 will

have 52 chances in 100 of dying as result of vascular disease; if that man reaches the age of 60, the likelihood of death from this cause is as 6 is to 10. The vascular disease, when associated with hypertension, will produce death from cardiac failure or coronary occlusion in 60 per cent of instances. Twenty-five per cent of the hypertensive individuals will expire as result of cerebral vascular accidents, 5 per cent on account of uremia and 5 per cent from a combination of heart and kidney disease in which it is often impossible to state the primary cause of death, and the other 5 per cent will gradually wear out with what has been termed general visceral failure. Arteriosclerotic heart disease and hypertensive heart disease are responsible for the greater number of deaths of the old individual. The heart is of chief importance in the list of causes of death, possibly in small part because a heart lesion is relatively easy to diagnose; instruments of precision have been evolved to study the organ, which study can be done more readily than is the case with any other of the viscera. Another factor which may play a part in bringing the figures of death from heart disease to the top of all causes of death is that if the practitioner does not know positively just what is the matter with the patient and what is the cause of death, a diagnosis of one or another form of heart disease is least open to criticism in the absence of unequivocal physical signs and definite diagnostic criteria.

Despite what has just been said about mistakes in diagnosis and the ready availability of methods of diagnosis of heart diseases, the fact remains that heart disease indisputably ranks first as a cause of death. As the older people are when they die and as age expectancy advances, it is heart disease which will cause a greater number of deaths. Because of what has been said in regard to people growing older in larger numbers, and as the actual number of old persons increases, it behooves the practitioner to consider seriously the importance of the care of older people and more particularly the care of the heart that is ageing. Parenthetically it might be observed that geriatrics as a science is receiving ever increasing attention and is of growing importance. It is quite within the realms of possibility that within the next twenty-five years, certainly within the next fifty years, as a specialty geriatrics may obtain the importance that the specialty of pediatrics now has in the field of medicine. The geriatrician will become the conservator of the health of the ancient; he will have learned to recognize the early signs and expressions of disease; he will make periodic diagnostic check-ups of his clientele; he will advise, instruct and guide in the modes of living, in proper hygiene, in adequate feeding and in many other details which will tend to minimize or obliterate the conditions which might and will induce disease. As Cannon, in a recent address delivered at Stanford University, makes clear—"the advantages to be derived from securing health and physiologic efficiency instead of being repaired after a breakdown need to be emphasized." It will be the job of the geriatrician to prevent "breakdowns" in the wearing out organism, just as it is the duty of the pediatrician to prevent diphtheria and whooping cough.

### FACTORS IN AGEING

Probably the one most fundamental cause of ageing lies in the wearing out of the arterial tree. Winternitz and his associates state that "the cause of arterio-

sclerosis is probably not to be found in a single factor . . . recognition of the artery as a vascular or potentially vascular organ, and therefore subject to the same pathological processes to which other tissues are subject, may prove more fruitful than one in which the lesions are regarded as primarily 'degenerative' or as the inevitable concomitants of age." Cohn, in dissenting from this point of view questions—"May not the inevitable concomitants of age be vascular change?"

Be that as it may, there are clearly recognized and inevitably discussed agents, many and varied, which are held to be responsible for an individual living to advanced age or dying at an early one. To no one of these factors can there be attributed a supremacy, any one of them may play a great or a minor part. Some of them may be called positive, they are there and nothing can be done about them. Others may be called negative; they may never be present in the life of an individual because he has kept them out of his life deliberately. To be discussed are: (1) heritage; (2) economic status; (3) geographic locality; (4) marital state; (5) previous illness; (6) endocrines, and (7) tobacco and liquor.

*Heritage:* Among the many pithy sayings of Oliver Wendell Holmes is that one attributed to him wherein he states to live to an old age pick your ancestors. The factor of heritage undoubtedly is considered to be the most important in accounting for longevity in an individual. Again and again numerous physicians have seen families whose members have lived to the eighth or ninth decade of life and who, when they were even at a relatively advanced age, were biologically younger than members of another family who had not reached an age at least twenty-five years younger than the first family. There is, without question, passed through the genes a tendency to arteriosclerosis, which inheritance will condemn more people to an early death than probably any other single cause. Fortunate indeed is the individual who has ancestors whose arteries did not develop the degenerative changes of old age until late in life. Such an individual will live to an old age if he is not an unfortunate victim of another hereditary disease, cancer, or if he survives a most frequent cause of death, automobile accidents, or if pneumonia does not supervene. The body habitus in these people is often of a distinct type. They are lean and often tall. However, such a bodily build does not necessarily imply that a person will live to an old age, nor is the contrary by any means always true. The Flexners, in their delightful biography of Dr. William Welch, state that he was short and rotund and that his midriff was circular in diameter, yet Dr. Welch was vigorously active physically, mentally alert intellectually, when the cancer developed which caused his death when well into his eighties. Certainly he is an example of the fact that generalities are often untrue, at least in part.

*Economic status* enjoys minor importance. It is to be anticipated that a man who is financially comfortable, who can always have an ample and adequate diet, who is not obliged by economic forces to live in close contact with his fellowmen, is going to have a greater chance of living to an old age than is he who has to undergo the vicissitudes of a difficult, poverty lived life.

*Geographic locality* seems to have some bearing on whether or not a person lives to advanced age. It has been shown that the residents of the eastern seaboard do not live as long as those in the midwest. This is probably explained by the

fact that the busy, hustling, active, concentrated life of the big cities in the East is not as conducive to longevity as is the peaceful, free from strain existence of the man who works in the praries of the midwest. As Pearl explains it, "the length of life is generally in inverse proportion to the rate of living." The East is essentially urban, the midwest rural. In the tropics and subtropics, diseases of the arteries are not as common nor as prevalent as in the temperate zone. Here again Pearl's explanation holds good. It is not the direct effect of heat on body mechanisms; but the heat itself does not allow an individual to live at a swift pace. The daily rise of temperature to high proportions definitely inhibits a person's activities. Life is, of necessity, calm and placid. Furthermore, the population is made up to a greater extent of people who live in rural districts than in the temperate zones where there are large collections of people in innumerable civic communities.

In so far as the *marital status* of an individual is concerned, it may be said that the married man or woman outlives his or her bachelor or maiden friend. The comparatively few years that are added by marriage to the possibility of longevity are probably statistically of no special significance. One might become facetious and express the opinion that if the factors of peace and calm which are supposedly responsible for people living longer in the tropics are true, they would be negated by the factor of the marital state. It is questionable if the life of married individuals is calmer and more placid than that of the unmarried, with their freedom from marital worries.

It is perfectly obvious that *previous illness* is of extreme importance. The man who is subjected to many illnesses in the course of his early life will probably die sooner than will the man who is not susceptible to infections of various types. One illness alone may be responsible for materially abbreviating the life cycle. An outstanding example of course is the child who has rheumatic fever and who will die at an early age from rheumatic heart disease. The individual who has the misfortune to contract syphilis almost surely will expire earlier in life than if he had not had this type of infection. The inadequately treated syphilitic patient, in a goodly proportion of instances, will die at a relatively early age as result of cardiovascular or cerebrospinal syphilis, or one or another of the tertiary manifestations of the disease. Early and midlife infections, of many and varied types, undoubtedly play an important role in the production of vascular disease. Winternitz, amongst some pathologists, contends that there is distinct "evidence for possible infectious basis for arteriosclerosis." This is an old concept recently revived by Winternitz and based on the finding of micro-organisms at times in arteriosclerotic plaques.

Imbalance or functional disturbances or diseases of the *endocrines* are not conducive to prolonged life. Such disturbances bring about elevation of blood pressure; some of them may result in primary heart disease, as the thyroid heart. Some may result in obesity with its well known tendency to shorten life; some may bring about metabolic disorders or high blood sugar or what not, and some of them result entirely in the dispositional changes which may accompany or be associated with endocrinologic pathology.

The physician, the preacher and the populace as a whole have for many years debated the effect of *alcohol and tobacco*

on the bodily functions. Certainly the totality of evidence incriminating tobacco and nicotine in predisposing to cardiovascular disease is decidedly more definite than the limited evidence that would tend to show that tobacco smoking has little effect on the vascular system. The statements of the proponents of the evils of tobacco smoking may be discounted to a certain degree by stating that not only do the great majority of the population of this country smoke, women as well as men, but that vascular disease amongst women is much less frequent than in males. Personally I do not feel that moderate smoking is in any way harmful. Excesses of any kind, from overindulgence in tobacco and overactivity at the table, to fits of rage and anger probably have a tendency to shorten the individual's life. In so far as alcohol is concerned, again excesses may be harmful but when used moderately, particularly in the latter years of life, I believe that alcohol is beneficial to the individual. The anteprandial high-ball or cocktail sipped quietly and imbibed when thoroughly relaxed from the day's strain, quiets psychically and at the same time probably exerts a dilatory effect on the blood vessels.

Pearl studied the social history of some 2000 nonagenarians and octogenarians; some of these subjects of study used alcohol, some were abstainers; some smoked, some did not; some ate to excess, others were restrained in their food intake. The only characteristic that Pearl found common to all of this group was a placid and calm disposition. These old folk took things easily in their stride as they came along; they did not let the problems of life and living disturb them unduly. Parenthetically it might be noted that Winternitz has written that "perhaps no one thing has done more to inhibit investigations in the field of arteriosclerosis than the established notion that it is one of the unfortunate accompaniments of old age, about which nothing more can be done than to suggest that the individual reach his old age through living in a socially desirable manner."

I have discussed ageing and the causes productive of premature old age to the apparent exclusion of the titular subject of this paper. I believe these preliminary remarks are germane because after all the heart is one of the earliest organs in the body to feel the effect of the ageing processes.

The question might well be asked, what is old age? It is a relative term. In contemporary life it is usually considered past 70, although the man of 70 may be chronologically older than the man of 55, but biologically younger. In countries or in ages where and when the life span was relatively short, a man of 40 would be considered as an elder statesman.

Wissler writes that in the Incan empire of pre-Columbian Peru there existed an all-embracing age classification of the male population. A man between the ages of 50–60 was half old, after 60 he was listed as "old man sleeping," privileged to spend his declining years in rest and slumber; after 50 the male stopped paying taxes. To many of us in this day and time the specter of old age would be less terrifying were we excused from paying income, property and luxury taxes when we reached midlife.

As man ages, his blood vessels, some to a greater extent than others, undergo involutionary changes which are known as sclerotic; it should be recognized that there is a difference in biologic age of blood vessels throughout the body. The

anterior descending branch of the coronary matures earlier than do most arteries; as a living structure it is one of the older arteries of the body. This fact is of aid in explaining why this particular vessel is somewhat more likely to become occluded or to rupture than are other branches of the coronary or other blood vessels throughout the body. The intimal notably, and to a lesser extent the medial, changes of advancing years are far more advanced in the coronary vessels than in the radial arteries. The coronary arteries only exceptionally show medial calcification (Mönckeberg's sclerosis) a characteristic late-life feature of the muscular and not of the elastic arteries.

The heart, unlike other muscular tissue in the body, increases in size and weight as the individual advances in years. This is contrary to other muscular structures, which waste in ageing; consequently the heart weight-body weight ratio decreases as the individual becomes older. As the organ ages its valves begin to show the effect of time, gradually their elasticity and pliability are lost. Fibrotic changes ensue so they become rigid and less readily do they approximate in systole or diastole. These valve changes are more pronounced in the left heart than the right. The consumption of oxygen per unit of muscle weight decreases with advancing age, suggesting "essential changes in the constitution of muscle with time" (Cohn).

As the years pass by, the blood pressure gradually increases but not to the high figures that the laity and sometimes the medical profession misconstrue as the figures for a person who is past the age of, say, 60. Willius studied a group of patients over 75 and observed that in the majority of subjects the blood pressure was between 150–160 systolic and the diastolic was between 80–90. Many old people have blood pressure which is substantially lower than these figures. Normally the blood pressure should not be higher than 150 mm. of mercury systolic, with a diastolic that does not change materially from that of middle life, that is, of course, assuming that the individual does not have some other cause (e.g., endocrine) to produce an elevation of blood pressure. By the sixth decade of life the ultimate figures for blood pressure are obtained and from thence on they remain unchanged unless some intercurrent disorder or disease develops.

The heart rate after birth slowly declines during the first decade of life. By the time a man is 30 years of age the rate is fairly well established for that individual and it so remains until the fifth decade when, according to Warthin, the rate falls slowly to 60 per minute. Gilbert has shown that pressure on the vagus (now known to be the carotid sinus) has an increased effect with increasing age, the heart is more and more slowed by neck pressure and more and more prolonged becomes the conduction rate from the auricle to ventricle. In late life the atropine-increase effect on the heart rate becomes less and less. The pulse rate in the response to the exercise test is more rapid and more prolonged than in youth, of course excluding trained subjects. The rhythm of the heart has been accepted as one of the important criteria of muscular or neuromuscular changes in the organ. Alterations in the rhythm will be discussed briefly in the presentation of the electrocardiogram of old people. Briefly, it might be stated that as age advances ectopics become more common, heart block may appear, transient attacks of fibrillation may occur or the heart may

fibrillate permanently without the patient showing evidence of heart failure, at least sometimes for many years.

### SUBJECTIVE SYMPTOMS

It is my belief that the subjective symptoms produced by the ageing heart are of greater value than any other one method of determining the efficiency of the heart muscle. The first evidence that the heart is beginning to "tire" easily and cannot respond to physical calls and demands as it did in previous years, is the feelings of the patient. Ease of fatigue is about as important as any other one symptom. Tiring under circumstances which would not have previously exhausted the patient is a prime symptom. Christian has stressed the importance of this expression of heart tire. It is remarkable how quickly fatigue develops with mechanistic cardiac defects. The man who has paroxysmal fibrillation will almost promptly, as the fibrillation develops, become almost overcome with fatigue. He will be worn out and done up and then if the paroxysm ceases in a comparatively few minutes he will come back to his previous state of normal vigor.

Dyspnea as a subjective symptom is invariably and rightly stressed. The intern never forgets to ask the patient if he becomes short of breath on slight exertion, but the same intern will rarely question the patient as to whether or not he becomes tired on slight exertion.

Anginal pain is another subjective phenomenon which is of extreme importance and definitely an indication for the cessation of any muscular or mental activity which is severe enough to bring on discomfort or even agony. Premature contractions occasion greater psychical distress than they do cardiac. The patient is conscious of his heart, it disturbs and irritates him when he notices as he describes it—the heart stopping momentarily, or turning over or jumping or what not. Ectopics suggest a reduction of mental activity of the individual, rather than physical. Cough is an important subjective symptom but one of severe rather than of minimal and early heart failure. As the cardiac reserve diminishes, breathlessness, substernal tightness on exertion, definite fatiguability become symptoms of greater importance than the objective and instrumental findings.

### THE PHYSICAL EXAMINATION

As age progresses, the bony thorax, through calcification of the costal cartilages, becomes more or less fixed; a certain degree of emphysema develops. Both of these abnormalities make it difficult accurately to outline the heart by percussion. Nowadays this is really of minimal importance because the routine two-meter x-ray plate to determine the heart's size is a universally accepted procedure. In auscultating over the precordium the physician often states that the heart sounds are "weak and distant." Actually the heart sounds may be distant but they give only the impression of being weak. The explanation is simple and elementary. The emphysematous lung overlies the heart, the chest has become rounded, the transverse diameter is greater in the older person so that the sounds actually are more distant from the bell of the stethoscope than in the younger individual, giving the impression of being weak and actually being relatively distant. Accentuation of the aortic second sound is likely to make its appearance after the age of 40. This may not be true accentuation but at least the aortic second sound is louder and clearer than is the pulmonic second which

characteristically is the louder and clearer basal second sound, at least until the age of 30. Systolic murmurs over the base or apex are common and of very little prognostic significance. They represent sclerosis of the valves or they may be dependent upon atheromatous plaques near the aortic valve openings. More definite and more obvious physical signs may develop as result of arteriosclerosis and hypertension. Arteriosclerotic heart disease in older people is, of course, common and depends primarily upon sclerosis of the coronary vessels. It often is associated with hypertensive heart disease. The two etiologic classifications, arteriosclerotic and hypertensive heart disease, are so closely correlated and interwoven that many physicians employ the term hypertensive arteriosclerotic heart disease when hypertension is present; arteriosclerotic heart disease only when hypertension is not outstanding.

### THE ELECTROCARDIOGRAM

The electrocardiogram in older people has been fairly extensively studied. Several recent papers deserve mention, that of Willius in 1931, a more recent one by Levitt in 1939, and still another by Eliaser in 1941. These electrocardiographic reports have to do with old people past the age of 70. Certain electrocardiographic changes occur in old age which are so commonly present that they might be well considered as normal for this age group, according to Eliaser and Kondo. Outstanding are left axis deviation, normally low voltage, sinus bradycardia, certain conduction defects and variations in the T wave in any and all leads.

In the present study I have selected all patients past the age of 50 who had electrocardiograms taken in the Heart

TABLE 1

*The electrocardiogram*

Analysis of 1,052 EKG's on 680 patients aged 50 and over

| | Number | Per cent |
|---|---|---|
| No definite EKG evidence of myocardial disease | 283 | 41.5 |
| Evidences of myocardial disease: | | |
| Left axis deviation (many of this type had only a slight LAD or curves typical of transverse heart. All below approx. +30° on Dieuaide chart were included) | 450 | 66.0 |
| Right axis deviation (all of these were beginning RAD) | 10 | 1.5 |
| Left ventricular strain (43 had so-called LV strain. EKG showed definite LAD, inverted or very low $T_1$ and upright $T_3$) | 43 | 6.3 |
| Sinus tachycardia—100 or over | 48 | 7.0 |
| Sinus bradycardia—60 or under | 23 | 3.4 |
| Auricular fibrillation | 21 | 3.0 |
| Auricular flutter | 1 | 0.15 |
| Shift of pacemaker (two of these interpreted as A-V nodal rhythm) | 4 | 0.6 |
| A-V block (1 showed transition from 2:1 to varying degrees of partial block; 1 showed transition between 2:1 and complete A-V block; 1 showed complete A-V block) | 3 | 0.4 |
| P-R upper limit of normal | 45 | 6.6 |
| P-R more than 0.20 | 12 | 1.8 |
| P wave abnormalities: | | |
| Prominent P in more than 1 lead | 20 | 3.0 |
| Significant widening or notching in more than 1 lead | 10 | 1.5 |
| Premature beats | 127 | 18.7 |
| Auricular (1 showed auricular prematures) | 43 | 6.3 |
| Ventricular | 80 | 11.8 |
| Nodal | 4 | 0.6 |
| QRS width over 0.10 (+29 or 4.3% with BBB) | 19 | 2.8 |
| Right bundle branch block | 16 | 2.4 |
| Left bundle branch block (2 transient; 2 atypical) | 13 | 2.0 |

TABLE 1—*Continued*

| | Number | Per cent |
|---|---|---|
| Abnormal slurring and notching of QRS (omitting splintered complexes as seen often in transverse hearts) | 13 | 2.0 |
| Lead I | 1 | |
| Lead II | 5 | |
| Lead I & III | 1 | |
| Lead II & III | 6 | |
| Significant Q wave—3 mm. or more than 25% of QRS | | |
| Lead I | 1 | |
| Lead II | 1 | |
| Lead III | 20 | 3.0 |
| QRS of low amp. highest deflection 5 mm. or less | 14 | 2.0 |

Station of the Hutchinson Memorial Clinic at Tulane. I have taken these patients irrespective of whether or not they were supposed to have heart disease. There were 680 in all and of these roughly about a half had heart disease, hypertension or arteriosclerosis. I am presenting this group as a whole, irrespective of whether or not they had heart disease, because they represent very much what a physician would meet with in his office; they were all ambulatory patients. I will not analyze them in detail. The tables will speak for themselves, but one or two important observations will be pointed out. Ectopics were not nearly as common as one would expect; only 18.7 per cent of the patients had this mechanistic abnormality. Conduction disturbances were rather unusual; a well marked sinus bradycardia was present in only 3.4 per cent. Left axis deviation was present in two-thirds of the patients. Other electrocardiographic abnormalities will not be recounted as they were of technical rather than of clinical significance.

MANAGEMENT

The management of the aged man or woman whose heart has given subjective or objective evidence of diminished efficiency fundamentally is comparable to that of the care of any person growing old, with accent on those factors which

TABLE 2

*T wave changes*

Where possible curve taken before digitalis was used

| | Had digitalis | Number | Per cent |
|---|---|---|---|
| $T_1$ low or ± | 6 | 57 | 8.4 |
| $T_2$ low or ± | 3 | 46 | 6.8 |
| T low all leads | 2 | 28 | 4.1 |
| $T_1$ inverted | 6 | 42 | 6.2 |
| $T_2$ inverted | 4 | 23 | 3.4 |
| T inverted all leads | 0 | 3 | 0.4 |
| Total | | 199 | 29.3 |
| Significant shift of ST segment: | | | |
| *Up* | | | |
| I | | 2 | 0.3 |
| II | | 1 | 0.14 |
| III | | 5 | 0.73 |
| *Down* | | | |
| I | | 21 | 3 |
| II | | 16 | 2.4 |
| III | | 4 | 0.6 |
| Total | | 49 | 7.17 |
| EKG compatible with diagnosis of old infarct: | | | |
| Anterior | | 1 | 0.15 |
| Posterior | | 5 | 0.7 |
| Total | | 6 | 0.85 |

may produce sudden or gradual heart strain. Fortunately, as Willius wisely and succinctly stated in discussing the treatment of the aged heart, "the general biologic processes of senescence often prove to be a subtle mechanism of self-preservation." The older man unconsciously slows down in his activities.

He does not tend to force himself as he did in midlife and the tempo of living becomes calm and more peaceful than is the strife of midlife. Often the self-imposed restraint is not carried sufficiently far. The physician may have to advise further restrictions of physical and psychical activities. Physical and mental rest are of extreme importance. Muscular rest should be systematically regulated and definitely controlled in the man who has shown evidence of heart tire until it becomes with him a matter of routine and habit. Rest after meals, when the blood pools in the splanchnic area, is of great importance. Half an hour reading the newspaper after breakfast, a short nap after lunch and complete relaxation after dinner in a comfortable armchair, often with a little nap thrown in, is of extreme value to the older man. The rest in the middle of the day after a light lunch should be for at least an hour. If it is impossible always to get the rest, patients should be advised never to engage in physical exercise immediately after eating. The coronary circulation

TABLE 3

*Precordial leads of 50 patients*

35 had one precordial lead over apex; 24 of these (68.6%) were within normal variations

27 had Ld IVF
- 18 had normal IVF
- 1 had notched R-IVF
- 1 had notched wide QRS (stand. lds. showed LBBB)
- 1 with deep Q-IVF (about 6 mm., R-IVF about 4 mm.)
- 1 had very small R-IVF. Main QRS deflection downward and notched. Upright T-IVF. Electrode possibly not over apex. Standard leads showed "atypical LBBB"
- 1 had low but upright T-IVF
- 4 showed downward ST shift
  - 1 with deeply inverted T
  - 2 with diphasic T
  - 1 with upright T

8 had old style 4B
- 6 of these apparently normal
- 2 had slight ST shifts and diphasic T waves

15 had more than 1 precordial lead
- 6 sets of chest leads across the precordium were of cases showing BBB in standard leads; 3 left, 3 right
- 1 set was on patient whose standard leads were compatible with old ant. infarct. These precordial leads showed presence of normal R waves but upright convexity of ST segment over left side, and rather sharply inverted T waves in $CF_{4,5,6}$.
- 2 showed changes indicative of defective IVC, but no BBB.
- 1 had $CF_1$ suggestive but not diagnostic of RBBB.
- 3 had normal series of chest leads
- 1 had low T waves $CF_{3,4,5}$
- 1 had small R waves all the way across, marked upward elevation of ST in $CF_1$ through $CF_4$ and upright T waves in all six precordial leads

TABLE 4

*Etiologic clinical diagnosis*

On 50 of the 680, no etiologic diagnosis available; of the other 630, the diagnosis was:

| | Number | Per cent |
|---|---|---|
| No heart disease | 63 | 10.0 |
| Heart disease—etiology unknown | 10 | 1.6 |
| Possible heart disease | 158 | 25.0 |
| Potential heart disease (hypertension) | 30 | 4.8 |
| Potential heart disease (AS) | 11 | 1.7 |
| Hypertension | 95 | 15.0 |
| AS and hypertension | 54 | 8.6 |
| Syphilis | 12 | 2.0 |
| Without complications | 6 | |
| With hypertension | 1 | |
| With arteriosclerosis | 5 | |
| Arteriosclerosis | 120 | 20.0 |
| AS and coronary sclerosis | 66 | 10.5 |
| ASHD—old coronary occlusion | 5 | 0.8 |
| Hyperthyroidism | 1 | |
| Cor pulmonale (emphysema) | 2 | |
| Rheumatic | 1 | |
| AS and rheumatic | 1 | |
| Congenital | 1 | |

is increased postprandially and for the short period after the ingestion of food no additional strain should be thrown on the coronary vessels. Proof of the necessity of such restriction is substantiated by the common occurrence of coronary accidents a short time after eating.

Physical and mental effort which bring about anginal-like discomfort or continued anginal pain, should be avoided. The potential or actual heart patient of midlife and past must learn to live within his limitations. It is rather extraordinary how physical measures which occasion pleasure may not produce the pain of angina, whereas those which are no more severe than the former and which are not associated with pleasure and enjoyment may bring about the chest pain of exertion.

The patient should be advised to obtain six to eight hours of sleep each night. It is not the part of good advice to recommend to the older patient to stay in bed many hours at any one time. The dynamics of the circulation are such that the supine position should not be assumed much more than the six to eight hours just mentioned. Let him stay in bed approximately seven hours and then the additional rest and the supplementary sleep may be obtained in a midday sleep or late afternoon nap. Restlessness and insomnia can be controlled by small doses of phenobarbital or the old fashioned chloral hydrate if the patient has difficulty in falling asleep when he first goes to bed.

Rest for a man who is unable to give up his daily occupation, who has not yet obtained retiring age and who occupies a salaried position is, of course, an extremely difficult problem. For these patients it is advisable to have them spend Sunday in bed or loafing around the bedroom in a bathrobe, completely dissociated from their daily activities, resting and relaxing for this period of 24 hours. When cautioning the patient about rest it should be remembered that there are certain physiologic functions of man which are entirely comparable to physical exertion. Straining at stool is an example; sexual excitement or sexual intercourse with the resultant orgasm should be reduced to a minimum or completely abolished. Emotional excitement of any kind is harmful. Emotional excitement may be brought about by the stand on the five yard line in an important football game of the alumnus' Alma Mater. It is said that every World Series baseball game is accompanied by the death of a certain number of onlookers who, in the excitement of the occasion, have had a coronary occlusion or cerebral hemorrhage or some related vascular accident. I presume that at the Kentucky Derby or the Santa Anita Handicap the same sequence of events may occur—great excitement, increased vascular tension, ruptured artery. If the man with relatively efficient heart function has some physical hobby or recreation which he enjoys and which gives him pleasure, do not make him stop in toto but let him reduce the amount of exercise that he does. He can eliminate the last four or five or even nine holes of golf in his weekly golf game; his work in the garden can be stopped when he has learned that thereafter fatigue may ensue and heart discomfort if he continues a longer time. It is not the part of good sense to change extensively a plan of living which the older person has gradually evolved over a period of years. Do not ask this patient whom we are discussing to give up the things in which he is interested; let him reduce but not eliminate. The person past midlife who has a hobby is fortunate

and doubly happy is the man whose hobby is a household one rather than outdoor. The man whose avocation has been shooting, hunting, fishing, golf and other sports which require physical effort will sooner or later find that the time will come when he can no longer engage actively in these recreations, whereas the man who collects stamps, who works in a machine shop in his basement or is interested in old prints or is a bibliophile can continue with his indoor hobby until death. The older person who can be occupied is much better able to withstand the vicissitudes of time and to avoid the morbid outlook of old age than is he whose life has been centered entirely around his business or professional activities. Retirement, for such as he, is often a signal for a rapid physical decline. Happy is the man who is his own boss, as is the professional man in theory. Fortunate is he who can cut down on the work he does as an employee without having to give up entirely his occupation. The elderly man who can keep occupied for a period of the day at least in the business that he has carried on for years is not going to break suddenly but to wear slowly.

The eating and drinking habits of the older man must be taken into consideration. A quantitative rather than a qualitative reduction in food intake is essential. If physical activities are diminished, sometimes the older person gains weight and then also there is always the ever present tendency to overeating when there is not much else to do. Fortunately nature takes care of this problem to a greater or lesser extent. It is unusual for a man past the age of 60 to increase his weight markedly. The weight curve usually becomes stabilized a decade earlier than this. The heaviest meal should be partaken in the middle of the day, succeeded by rest and a nap. The nocturnal repast should be light. A glass of milk with a few sweet crackers before retiring may ensure prompt sleep and a restful night.

It is my belief that a glass or two of wine with the evening meal or a cocktail or high-ball on returning from work in the evening before dinner, is relaxing, enjoyable and beneficial. If a man has been a steady consumer of alcohol all of his adult life there is not much use in trying materially to reduce his alcohol intake. By the time he is approaching senescence and has not been hurt by alcohol it probably will do him no harm at that time. It is not advisable to break life-long habits, even when in theory they may be deleterious. This applies both to the smoking and the drinking habits.

Robbins writes most intelligently when he says that "the treatment of the aged is one that calls for tact, sympathy and consideration on the part of a physician to the patient." Do not try to be too bossy as to the man or woman's living habits or too dogmatic in laying down the law as to the manner in which they should exist. Give your advice in homeopathic doses. Slowly but gradually inculcate in the mind of the man whose heart has begun to show early signs of failure that he cannot do this or he cannot do that. Antagonism rather than cooperation may be the result of telling a man, who has had a busy and active life, out of a clear sky that he cannot do that, cannot do this or he cannot do something else which he has done all his life. The average man, and to a lesser extent the average woman, resents getting old and he dislikes being told just what he must do, how he should do it and being reminded that he cannot do many things that he had done previously. Go about

giving such advice gradually, with tact, with sympathy and with consideration.

Drugs should have a minor part in the care of the ageing heart. Treatment should be physical rather than medicinal. However, if heart failure has ensued or early heart strain has evidenced itself, then digitalis may be advisable. On the whole, however, digitalis is not indicated in the small doses which are so frequently given, more or less on general principles. I would call attention to the well known fact that auricular fibrillation is very common in the old people who develop pneumonia. With the older person who has this particular respiratory-tract infection it is advisable to start digitalis immediately so that if necessity arises he can be digitalized promptly and at once. Hyperthyroidism developing in a person after the age of 45 is also likely to be followed by auricular fibrillation or rather associated with it. Here again is an indication for digitalis in an elderly person, particularly if quinidine will not control the heart irregularity. If there is definite angina pain on exertion or if the pain is not particularly pronounced or even merely suggestive, nitroglycerine should be given to control the symptom. For the high-strung, mentally keenly active hypertensive individual who so frequently has insomnia, phenobarbital morning and night in doses of 0.032 gram is helpful. For this type of person with hypertension I make no attempt to combat the hypertension per se with drugs that are supposed to reduce blood pressure. I usually employ sedatives only and give either one or another of the barbiturates or the old fashioned mixture of chloral hydrate, sodium bromide and peppermint water. If there is definite evidence of coronary disease, in order continuously to increase coronary flow, I order one or another of the theobromine preparations, preferably theocalcin because it is less irritating to the stomach. I continue with this drug indefinitely and usually tell my patients they are wedded to it for the rest of life. Theominal is another excellent preparation for the keen, keyed up nervous type, but I prefer to give the phenobarbital alone so that I can modify the dose as needed. Aminophyllin is certainly a splendid drug for the patient who has from time to time coronary pain and whose coronaries are probably sclerotic and constricted. Any of these xanthine preparations are definitely indicated in the treatment of the man who has had the warning signals or who has previously had mild coronary occlusion. In conjunction with the latter I would like to digress a minute to speak about the use of morphine in an acute coronary attack. It is often necessary to give this drug in order to control the pain, and to give it in large doses, but it is not an ideal drug for the purpose. It sensitizes the vagus and increases coronary constriction. If the pain is not especially severe, or as soon as it becomes ameliorated to a certain extent by the morphine, replace this drug with papaverine 0.032 to 0.065 gram as needed. With the morphine incidentally, atropine should be combined, as it to a certain degree counteracts the effect of the morphine on the vagus.

### SUMMARY

I have presented to you this evening some facts concerning the heart as man approaches senescence. I have discussed the symptoms, the physical examination, the electrocardiographic findings of the older patient whose heart is beginning to show evidence of age. I have given to you my ideas about the treatment of these individuals. Tact, moderation, common sense should be the passwords.

Guide the elderly individual gently and firmly. Do not let him overdo in any way, physical, mental or gustatory. Above all do not be too solicitous, for fear he may become introspective and unhappy in the fading years of life.

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# An Hermetic Plague-Tract by Johannes Mercurius Corrigiensis

*Text, Translation, and Bio-bibliography of the Author*

## PART II: BIO-BIBLIOGRAPHY*

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PERHAPS the least confusing method of reviewing the provocative and not generally accessible data on the life and works of Johannes Mercurius Corrigiensis would be to anatomize briefly the works attributed to him and the important references to him in the literature, presenting the items in each section in chronological order. The works of Johannes, as might be imagined after a reading of the plague-tract, are quite as rich in biographical revelation as the references to him in the literature.

### Works Attributed to Johannes Mercurius Corrigiensis

1. [*Oratio ad sanctam crucem*], Rome, 1499 (1). This is the earliest of the dated works. It is a broadside printed in the shape of a huge cross. In it Johannes appears as a God-sent prophet endowed with the triple discipline[1] of the ancient philosophers and announcing to mankind the judgement of God. We learn from it that, having made his way from Milan through Italy to Rome as a mendicant, together with his venerable pregnant wife and five delicate, elegant children, not with the foolishness of the empirics nor the levity of hypocrites, nor with any thought of shameful, unspeakable, or reprehensible gain, Johannes now presents this *oratio* for the glory of the Holy Trinity and the joy and consolation of the Catholic flock and the confusion of infidels and the impious, to all races, peoples, tribes, tongues and nations, and to all kings and princes.

2. [*Exhortationes in Barbaros Thurcos Scijthas . . . perornate*], Lyons, May 26, 1501 (2). Printed "at the order and mandate of the magnificent lord John Mercury of Correggio," and designed for presentation to Louis XII, perhaps on his arrival in Lyons on June 2d,[2] the *Exhortationes* is, as the title indicates, a call, lengthy and very violent, to all Christians to war on the Turks and all the Christian infidels. The author purports to be, not Johannes himself, who is invariably referred to in the third person, but the spirit and wisdom of Jesus (*Iesu virtus et sapientia*) personified—one of the many

* Part I (Text and Translation) appeared in the *Transactions & Studies*, June, 1941 (4. ser., vol. 9, no. 2, pp. 96–111). The printers assume responsibility for the collapse of par. 6, p. 105 therein, which appeared *corpore sano* in the final page-proof, and promise that in the reprints the straying letters will be back in the groove. Also in Part I, footnote 8 (p. 107) is entitled to the following corrections: l.7, for *triplicivita* read *triplici vita*; l.8, for *prosenibus* read *pro senibus*; l.9, insert "New York:" before "Columbia." Page 111, l.9: for *individual* read *undivided*—a stupid error kindly called to my attention by Dr Burton Chance.

[1] *I.e.*, philosophy, medicine, and religion.

[2] See Niepce (9), p. 119, *n.* 1, on the dates of Louis' visits to Lyons.

mystico-religious concepts that pervade the work.

Early in the introduction we find Johannes presented again as the richest of paupers, God's defender and shield-bearer; we find him still accompanied by his faithful, zealous, afflicted wife and their noble, elegant, gentle, mendicant, pitiable and portentous militia of five children.[3] Again, "this corruscating, resounding and shining proclamation is promulgated for one and all, all kings, princes, peoples, tribes, tongues, and Christian nations. . . . Whoever has ears, eyes, and hands for receiving, let him receive." Johannes' name recurs like a refrain in a long series of chapters addressed successively to reigning kings and princes. In the eleventh chapter, addressed to the pope (Alexander VI), the wrath of the Almighty is called down upon Rome and especially upon those who have forbidden our Mercurius to return to the feet of the pope, thus despoiling the latter of the precious gift which Mercurius had promised him. Chapters 37–41 are devoted to a description of the magic properties of a sword and shield which are offered to King Louis. In chapters 48–49, Louis is implored to share his bread with a hungry man, and to take into his house this destitute, wandering mendicant, with his wife, whose name it now appears is Helena Maria, and the militia of five children. He is urged to remove the iron chain from Mercurius' neck, and from the backs of the children the sack and all the burdens of beggary. In return, the king is promised that, through Mercurius, he shall have a male child, shall be rejuvenated and have years of life beyond his allotted time.

3. *Contra pestem* . . . , s. l., a., t. n. (3).

[3] Note that the number of children remains five, despite the fact that in the *Oratio* of 1499 Johannes' wife is said to be pregnant.

This plague-tract, which we have here reprinted, was bought in 1922 from the late Wilfred Voynich, who professed to know nothing further concerning Johannes than that he was the author also of the Antwerp, 1502, edition of the *Exhortationes*. Referring to the *Catalogue of Books Printed in the XVth Century Now in the British Museum*, he assigned the type to that used by Besicken, of Rome, only in the printing of his Paulus *Practica*, 1493.[4] This type, however, it appears from the *Catalogue*, is found again in a later state, "probably after 1500". Professor Dean P. Lockwood, of Haverford College, was kind enough to compare a photostatic copy of our tract with the example of the Paulus in the Harvard College library, and has given it as his opinion that the tract's type unmistakeably belongs to the later state.[5] The water-mark, a hand surmounted by a star, perhaps most nearly approximates, in Briquet, one of the 16th century variations of this mark.

It is clear that the tract was written for the Roman public. The medical recipes are based on the standard mediaeval authorities, and one would say, directly, since almost exact quotations have been found. The hermetic influence, and this of course is what gives the tract its unique quality, is revealed, obviously, in the mystical medicine first prescribed; in the poultice composed of myrrh, frankincense, and gold; in the description and recommendation of the philosopher's stone; in the concluding admonition that the privilege of dispensing this mystical gift of the Lord God is granted to Johannes alone, the physician of physicians. The recipe for the poultice was unquestionably derived, as we have seen, from Marsilius Ficinus, a contemporary leader

[4] BMC IV, 138.

[5] Personal communication.

in the hermetic renaissance. The description of the philosopher's stone borrows in part from the *Emerald Tablet* of Hermes, a basic hermetic work which, curiously enough, seems not to have been printed until 1545.

4. Manuscript *Sonetto* (4). There remains one other work which is probably to be ascribed to Johannes Mercurius. This is an unpublished manuscript sonnet, recently discovered by Paul Oskar Kristeller, written "by one called Hermes junior, who harangued and publicly predicted things marvelous beyond nature and recently arrived in Rome with a great train of followers." A marginal commentary on the poem is the work of Carlo Susena (Sosenna), lecturer in arts and medicine at the University of Ferrara, 1489–90; in astrology, 1491. It is of some interest that the commentator connects one of the poet's allusions with pope Alexander VI (pope, 1492–1503), who figures in the broadside of 1499 and again in the *Exhortationes*.

References to Johannes Mercurius

[*Cesena Chronicle*] (5). Under the year 1484, there is recorded in a manuscript chronicle of the town of Cesena the following note: "One of the gentlemen of Carpo this year went to Rome upon an ass, clothed in white, and on the garment was represented a bloody death's head with certain highly decorated medallions which proclaimed *Vacua vacuis, plena plenis* on the altar of Saint Peter, with certain other professions to the effect that he was the true Messiah."[6]

*Epistola Enoch de admiranda ac portendenti apparitione noui atque diuini Prophetae ad omne humanum genus* [ca. 1490] (6). The new and divine prophet whose apparition is described herein is, of course, none other than Johannes Mercurius Corrigiensis. "On Palm Sunday, April 11, 1484, there appeared at Rome before Pope Sixtus IV, the bishops, priests, nobles and the solemn multitude an unknown man *in the name of the living and dreadful Judge* and talked with many men with a winning friendliness and wise words. He was about 33 years of age, of medium height and slender build, his countenance emaciated and venerable, and he had long, wavy, chesnut-brown hair. Although he was not learned in grammar and rhetoric, he possessed a natural eloquence. Pharisaic hypocrisy was wholly foreign to him; nevertheless, thanks to divine inspiration he was excellently versed in doctrinal faith. When admonishing, he spoke softly and mildly, when rebuking, fearfully and majestically."[7] Upon his head he wore a bloody crown of thorns. He himself wore a silver plate that proclaimed him to be Pimander. The words *Vacua vacuis, plena plenis* appeared on the trappings of the ass upon which he rode. He distributed scrolls which said that he was *Johannes Mercurius de Corigio sapientiae angelus Pimanderque*. After several days of talking with the people of Rome, he returned, Enoch tells us, to his wife and children at Bologna, where he lives with them. Enoch himself was so impressed with what he had seen and heard that he forthwith abandoned Parnassus[8] to follow this new and divine prophet.

[6] *Uno di li signori da Carpo questo anno andò a Roma in su uno asino, vestito de biancho, e apresentò la veste con una testa d'un morto insanguinato con certe medaglie dorate grande che dicevano: "Vacua vacuis, plena plenis" in suso l'altare de santo Pietro con certe altre profecie dicendo essere el vero Messia.*

[7] Translated from Ohly (14), p. 135, who notes the resemblance to Christ and his entry into Jerusalem. The year given in the original text is 1485, but Ohly points out that during the reign of Sixtus IV Palm Sunday fell on the 11th of April in the years 1473 and 1484, and concludes that the latter must have been the year of the apparition.

[8] *I.e.*, the profession of poetry.

[*Cesena Chronicle*] (5). Under the date 1499, the Cesena Chronicle contains a more specific mention of Johannes: "Master John of the gentlemen of Corregio passed through here dressed in sackcloth, he and his household of about 12, with a staff in his hand, lodging in the hospices the women and children: he went to Rome."[9]

*Lodovicus "Enoch" Lazarellus.* To Kristeller (7), who discovered the manuscript *sonetto* by Hermes junior, we owe also the discovery and publication of three prefaces dedicated to Johannes, contained in a 15th century manuscript. The first preface introduces Marsilius Ficinus' translation of the *Pimander* ascribed to Mercurius Trismegistus, who was obviously the name-sake of our Mercurius; the second, the *Asclepius* attributed to Apuleius; the third, the *Definitiones Asclepii*, "translated from Greek into Latin by Lodovicus Enoch Lazarellus for his preceptor Ioannes Mercurius de Corigio." In all, a collection important for the study of the transmission of the hermetic writings, and also for the study of the life and works of Johannes Mercurius Corrigiensis, as we shall see.

*Trithemius* (8*a*). The only extended appearance of Johannes in the literature until modern times occurs first in the *Chronicon Sponheimense* of Trithemius, written in the years 1492–1506. Trithemius here purports to describe the sojourn of Johannes in Lyons during which the *Exhortationes* was published, though he does not mention this, or any of the other publications attributed to Johannes. A slightly amplified version of his story appears in the same author's *Annales Hirsaugienses*, written a few years later.[10] A translation of the latter follows:

> There appeared in France at this time [1501] an Italian whose proper name was John but who arrogantly wished to be called Mercury. He had with him his wife and children and both male and female servants, all of whom, including himself, were clothed only in linen and wore about the neck iron chains, after the fashion of Magister, as Damis has it, and of the Tyanean Apollonius, following Philostratus. Of this Tyanean philosopher-magician (as he was commonly held to be in his time), this Mercurius boasted he was an imitator and disciple, and he promised great, extraordinary, and downright miraculous (should I say, incredible) things. For he boasted that he comprehended all the learning of all the ancient Hebrews, Greeks, and Latins, and despised practically all the ancients, philosophers as well as theologians, since compared to him only, he said, they were all unlearned and no one of them appeared to be wholly wise regarding the mysteries. Whence he confessed that he was versed in all the knowledge of the world, understood all the mysteries and arcana of natural things, was able to discover the deepest meanings of the scriptures, and knew everything that mortal man could know.
>
> He bore himself with great gravity in public, in manners and approach he was mature with a certain severity and lived a sufficiently austere life of indigency. He averred that he had been born for the highest things, asserted that he was full of divine power, and declared great things were possible. The true transmutation of metals, which all alchemists seek no less fatuously than laboriously, this Mercury promised, and wished to seem to know all things and be ignorant of none whatsoever. He boasted that he could make propitious what was unpropitious and change the propitious into the opposite, which he said ought to be done not with the aid of demons, but by the art of natural magic (which ancient kings and wise men had properly valued). But he was, as I have heard from those who talked with him, quasi-illiterate and insufficiently versed in the Latin tongue.
>
> He remained for some time at Lyons in France, experiencing no little favor from Louis, king of the

[9] *Miser Jovanno de signuri da Coregio passò qui vistito de sacho lui e la famiglia suo circha a 12 con una canna in mano alogiando a li spedali le donne e fioli; andava a Roma.*

[10] According to Ohly (14), the later version contains the following additional details: mention of the followers as well as family; accentuation of the fact that Johannes was unlearned in Latin; Johannes' promise that he could influence favorably through his art the destiny of the king and his family; mention of the three informants.

French, who, having summoned his doctors of medicine, bade them, as a test, dispute with him on learned subjects. Obeying the royal mandate, the doctors meet with Mercury, talk and dispute with him. They find him ready on all points, and are amazed and astonished that a man too unlettered to have an adequate knowledge of Latin should have talents so profound, especially in medicine. Returning to the king after the examination, the doctors said that he had a more than human wisdom, but they were utterly ignorant as to whence he had acquired these great powers or where the secret lay hidden in him.

This Mercury gave to king Louis a sword, filled with 180 small swords and made with miraculous ingenuity, and a shield with mirror fashioned with singular skill, which was supposed to contain some occult quality. Finally, he promised that the queen would bear the king a son, on whom he could bestow felicity and whom he would single out for felicity beyond that of Alexander and Charlemagne, even though the stars should threaten the contrary. He promised that through his art he would give the king 20 years of life beyond his natural period. And he proposed other things not only wonderful but even impossible, it seems to me, except for God, who alone can accomplish all things. Whether he had any of these powers from God, I was not able to know. The gold with which he was honored by king Louis he distributed among the poor as soon as he had left the palace, keeping back none for his own use. These facts I learned first from the letters and then from the conversation of two learned men, Eustace and Narcissus, one of whom lives today at Lyons, the other at Paris. As a third witness, I adduce John Virdung of Hassfurt, mathematician of the Count Palatine, and he lives pleasantly today at Budoris with his prince, Louis. For the sake of brevity, I omit more details concerning this man, lest I become prolix. Where this miraculous Mercury went, or where he now may be, I have no means of knowing.

*16th–19th Centuries.* In 1879, Niepce (9) performed a useful service by analyzing the specific contributions of most of the accounts of Johannes that had appeared in the literature up to that time (8 *a*(*1*), *c–f*, *h–k*). His analysis leads to the conclusion that all of them were based, directly or indirectly, on the Trithemius account. In 1739, however, Dom Liron (8*f*) published a brief note on the Antwerp, 1502, edition of the *Exhortationes*, the first reference in the literature to any of Johannes' writings; and a contemporary of Niepce, Desbarreaux-Bernard, had, in 1877, reported his discovery of a copy of the Lyons, 1501, edition (8*k*). Neither the *Oratio* nor the plague-tract has been recorded in the literature until our own day.

*20th Century.* The plague-tract entered (on the basis of our copy) a major bibliographic list for the first time in 1926 (10) and its author reappeared in the literature a few years later (1934), in Thorndike's resuscitation of the Trithemius story (11*a*).[11] In 1935–6, our mimeographed *Fugitive leaves* (12) presented a translation of the plague-tract, with a commentary. Through the kindness of Mons. (later, cardinal) G. Mercati, of Rome, we were able to refer therein to the Niepce article, with its various earlier references; and, through the kindness of Kurt Ohly, of the Berlin Kommission für den Gesamtkatalog der Wiegendrucke, to the *Oratio ad s. crucem.* Wickersheimer (13), in 1936, contributed a brief, entirely derivative, account of Johannes. Since then there have appeared two contributions of major importance to the study of the life and works of Johannes Mercurius Corrigiensis.

In 1938, Kurt Ohly published a detailed account of the remarkable *Letter of Enoch* describing the apparition of the new and divine prophet, Johannes Mercurius de Corregio (14). From Italian colleagues he had learned of Paul Oskar Kristeller's then-unpublished discovery of the three prefaces dedicated by Lodovicus Enoch Lazarellus to Johannes Mercurius Corrigiensis. The general character and specific features of the works enabled him to establish indisputably the identity of

[11] Thorndike also incorporates some of the recent data on Johannes in his latest volume (11*b*).

his pseudonymous Enoch. But he went further than this. Noting the extraordinary stylistic and verbal affinity between the works of Johannes and those of Lodovicus Lazarellus, he came to the conclusion that, if Lazarellus was the author of the Enoch *Letter*, he was also the author of the *Oratio*, the plague-tract,[12] and the *Exhortationes*. In other words, he proposed that Lazarellus either invented the character of Johannes Mercurius or, through his writings, exalted some perhaps insignificant revivalist to the stature of a God-sent prophet. Ohly was made suspicious by the paucity of contemporary references to the astonishing appearances of Johannes, remarking that those in the Cesena Chronicle might well have been based on the *Letter of Enoch* and the *Oratio*, respectively. Distrusting Trithemius on principle, despite the latter's statement, in his second account, of his sources, he believed that, if Johannes was a fictitious character, Trithemius may have based his story on an unprinted or not yet discovered account by Lazarellus of the Lyons performances of his Mercurius. Ohly recognized, on the other hand, that, in a literary fiction, the naming of little Corregio "is a detail whose invention presents an element that is superfluous and at the same time susceptible of proof."

Kristeller in the same year (1938) published (7) the three prefaces dedicated by Lazarellus to Johannes, related the little that is known of the life of Lazarellus, and pointed out his hitherto unrecognized importance in the transmission of the hermetic writings. As Lazarellus is said to have died in Italy in 1500, as the *Exhortationes* was not published until 1501, in France, and as Trithemius' and the Cesena accounts seem sufficiently circumstantial, he regarded Ohly's hypothesis as a "strange conclusion." The stylistic affinity between the works of the two men he believed is to be attributed to the strong community of ideas existing between them.

### Lodovicus Enoch Lazarellus

Before embarking upon any discussion of these data, it is advisable to have on the record the added data on the life of Lazarellus brought to us by Kristeller (7). Practically all that is known of Lazarellus stems from a brief biography included in an edition of his poems which was published in 1765. According to this biography, he was born at Sanseverino, in the Marches, in 1450, functioned as tutor or secretary at Atri, Teramo, Camerino, and Rome, was publicly crowned poet by Frederick III in 1469, and died in his native province, June 23, 1500. His biographer says that, besides Greek, he studied Hebrew, mathematics, and astrology, and that "with the sign of the cross, he many times ejected unclean spirits and other disorders, and foretold future happenings, whence perverse persons suspected that this holy man was instructed in the magic arts."[13] He was in communication with the Neapolitan and Roman humanists, but evidently not with the Florentine, such as Marsilius Ficinus.

Lazarellus' participation in the mystico-religious, hermetic movement is evidenced by other works than those we have already encountered. A poem on the silk-worm (*Bombyx*), printed first about 1495,[14] treated symbolically, in the spirit

[12] The contents of which he had become acquainted with through our *Fugitive leaves* and a photostatic copy of the tract which we sent to him.

[13] *signo crucis spiritus immundos aliosque morbos pluries eiecit, futura vaticinatus est unde perversi homines virus sanctissimum magicis artibus instructum suspicati sunt.*

[14] Copinger-Reichling 3522. BMC IV, 125 [Rome: Euch. Silber]. Klebs 590.1. Ohly (14) dates it ca. 1495. See Maggs Bros.' Cat. 656 (1938)

of a hermetic mystic, the birth and resurrection of Christ.[15] A more or less original hermetic work, *Crater Hermetis*, was published several times in the 16th century, probably first in conjunction with the French humanist Jacobus Faber's translation of the *Pimander*, Paris, 1505. Lazarellus' translation of the *Definitiones Asclepii*, a manuscript of which was included in the codex found by Kristeller, was published at Lyons, 1507,[16] in a volume of miscellaneous works, several of the hermetic school, written or commented upon by another French humanist, Symphorianus Champerius.[17] An unpublished alchemical *vademecum* by Lazarellus is dated by Thorndike and Kibre "c. 1500".[18]

### Pro and Con

No one who has studied and compared the hermetic works of Lazarellus and all of the works attributed to Johannes Mercurius could fail to be attracted forcibly to Ohly's conjecture that Lazarellus was the author of the works attributed to Johannes, and that therefore he must either have invented the character of Johannes Mercurius or glorified, through his writings, the powers and personality of some otherwise insignificant wandering evangelist and magician. The stylistic and verbal evidence is too striking to be lightly dismissed. As Ohly suggests, the references in the Cesena Chronicle are not necessarily independent sources; furthermore, Trithemius' informants also *might* have been merely elaborating on the details found in the *Exhortationes*[19]—and, aside from the writings attributed to him, these are the only known contemporary non-Lazarellian sources referring to the existence of Johannes Mercurius. Two rather interesting points suggested by the biographical sketch of Lazarellus have not previously been commented upon in this connection. One is, that if Lazarellus was born, as his biographer states, in 1450, he would have been the same age in 1484 as that attributed to Johannes by "Enoch." Secondly, it is interesting that Lazarellus' biographer ascribes to his subject much the same magic powers that the *Iesu virtus et sapientia* of the *Exhortationes*, and Trithemius, ascribe to Johannes. Could it be that Lazarellus merely projected himself in the fictitious character of Johannes? Lazarellus states that Johannes was unlearned in grammar and rhetoric—and yet he translates from the Greek not into Italian but into Latin for him and addresses the prefaces to him in Latin. Trithemius refers to the astonishment of the examining doctors that a man so inadequately versed in Latin should have such profound knowledge, especially in medicine—and yet the Johannes works are written in a Latin which, if crude, is as intelligible as the

no. 153, for a copy advertised as "the author's copy with marginal additions and proof corrections." This firm was kind enough to send me a photostat of the first page of this copy.

[15] Ohly (14), p. 140.

[16] The heading of the printed version shows a curious variation from that of the manuscript, the former reading: "... *per ludovicum lazarellum ad patrem suum Iohannem ay.* (sic) ... *traducte.* It would be interesting to know the meaning of the *ay*.

[17] *Liber de quadruplici vita* ... Kristeller (7) suggests that manuscripts of the *Crater Hermetis* and the *Definitiones* may have been brought into France by Johannes Mercurius—an attractive suggestion; but they might have reached Faber and Champerius in many other ways, as both traveled in Italy and maintained contact with the Italian humanists.

[18] "A catalogue of incipits of mediaeval scientific writings in Latin," col. 290. Cambridge, Mass.: Mediaeval Acad. of America, 1937.

[19] Had Ohly been acquainted with the whole of the text of the *Exhortationes*, and not merely with the passages quoted by Desbarreaux-Bernard (8*k*), he would probably have felt that it sufficed as a source for the Trithemius account.

mystical nature and jargon of the subjects permit.

On the other hand, how are we going to attribute all of these works to Lazarellus, if, as his biographer states so circumstantially, he died in his native province on June 23, 1500? The Lyons *Exhortationes* was clearly designed for Louis XII, and the proximity of the printing date, May 26, 1501 to that of Louis' arrival in Lyons, June 2, suggests itself as being rather more than fortuitous. Since there is no mention in the *Letter of Enoch* or in the *Oratio* of the little town of Cesena, there would seem to be little reason for the references to Johannes in the Cesena Chronicle, if the events recorded therein had not taken place; and if the references were, for some reason, based on the two publications, there would have been no cause for the vagueness of the first reference, as the Enoch *Letter* supplies Johannes' name and provenance. As for Trithemius' account, it may be said that, in a number of important details—such as the examination by the doctors of medicine, the precise description of the magic sword, and Johannes' distribution among the poor of the gold given him by the king—it goes well beyond the data supplied by the *Exhortationes*. It would be difficult now to identify those learned informants Eustachius and Narcissus, but Johannes Virdung von Hassfurt was a person of considerable renown and one in whose range of interests Johannes' exploits would definitely fall.

As the question of motive inevitably presents itself in a case of this sort, one may inquire as to what purpose Lazarellus might have had in inventing the person of Johannes. Obviously, granted that these works were intended for publication, this could only have been to perpetrate a literary hoax for egoistic reasons or to spread the author's mystico-religious beliefs more forcibly by employing a dramatic symbol in the form of a modern Messiah. For either of these purposes, the Johannes of the *Exhortationes* and the plague-tract emerges as a pretty substantial, full-blooded figure "on the make". Did one encounter, however, a persuasive *Bussprediger* from Correggio named Johannes "Mercurius," eloquent if unlearned, one might follow him and put one's literary talents to work in the furtherance of his cause. In some such way it might be possible to attribute to the literary Lazarellus the *Oratio*, and even the *Exhortationes*, if it could be proved that Lazarellus' biographer had placed the date of his death at least one year too early; in neither of these works does Johannes appear in the first person. Despite the several characteristic phrases, the hermetic echos, of the plague-tract, which link it closely with the *Letter of Enoch*, the *Oratio*, and the *Exhortationes*, the quite different subject matter and the use for the first time of the first person singular allow the thought that the tract is possibly the single genuine published work of a quite substantial Johannes "Mercurius" Corrigiensis. One notes the lack of mention, in the plague-tract, of the author's otherwise ubiquitous family, and one recalls to mind the hitherto unobserved statement in the *Exhortationes* that Johannes had been forbidden to return to the feet of the pope. But a return to Rome, city of limitless possibilities, after the death of the pope in 1503 would seem a not implausible move for such a man as this Johannes. The bibliographic evidence of the *Exhortationes* and the plague-tract certainly tends to suggest either that Lazarellus lived for some little time after June 23, 1500—or that Johannes did effect such a return. But all this is mere conjecture, and we may more profitably accept Ohly's sug-

gestion that the problem now centers in further investigation of the life and works of Lazarellus—retaining, however, the harmless impression that the Johannes of our tract, with his little laboratory or shop and his threat of dire punishment for the plagiarizer of his *vademecum*, would be an uncommonly lively ghost.

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# Memoir of Henry Keller Mohler*

*By* THOMAS A. SHALLOW

HENRY KELLER MOHLER was born in Ephrata, Pennsylvania, in 1885, the son of William and Amanda Keller Mohler, both of whom survive him. He was a direct descendant of Ludwig Mohler who emigrated from Switzerland and settled at what is now known as "Mohler's Corner" at Ephrata in the year 1732.

Dr. Mohler's boyhood days were those which could be recounted by the offspring of most of the sturdy pioneer stock that made up young America. While attending grade school, he worked for the local grocer and druggist, and from the latter, he received his first inspiration to study medicine.

With this ambition uppermost in his mind, he graduated from the local high school with honors. Leaving home at the age of 16, he came to Philadelphia and obtained a position in a drug store, receiving compensation sufficient only to eke out an existence, but always too proud to ask for assistance from home. Realizing that he could not afford to enter medical college, he decided to enter medicine through the Philadelphia College of Pharmacy—the same avenue traveled by many distinguished men of our profession. I think now of Willis Manges, Fielding Lewis and many others. Henry worked his way through this institution, graduating with honors in 1907. His training in pharmacy and pharmacology served him well in later years when he became Sutherland M. Prevost Professor of Therapeutics at Jefferson Medical College.

The program which Henry had outlined for himself was interrupted on his graduation from the Philadelphia College of Pharmacy. Due to the strain of long hours of study and the physical hardships which he had endured for many years, his health failed and he was compelled to return to his home in Ephrata for a year's physical and mental rest.

The following year, 1908, Henry returned to Philadelphia as a student at Jefferson Medical College. Once more he was self-supporting, earning his tuition by working as Night Druggist in the Hospital. After studying and working day and night during the entire curriculum, he graduated from Jefferson in 1912, receiving the highest honors in his class.

From this time, his progress was one of continued success. He served Jefferson as Intern, Hematologist, Medical Director, Professor of Therapeutics and Dean of the College.

Dr. Mohler seldom spoke of his ancestors except to say that some one of them served his country from the Revolutionary War to the World War, he, himself, serving in the American Expeditionary Force as Chief of the Medical Service of Base Hospital #38, with the rank of Major.

He was recognized by membership in all the leading medical societies in the United States and received honorary degrees from several literary colleges.

Death on May 16, 1941, from cerebral hemorrhage, came at the zenith of his career, cutting short a life which would have added much to the art and science of medicine—but, in the words of Tennyson, "tho' much is taken, much abides."

* Read at the meeting of the College of Physicians of Philadelphia, December 3, 1941.

# Transactions of the Sections

## SECTION ON GENERAL MEDICINE

*Regular Meeting, October 27, 1941*

Extreme Tachycardia: Report of Prolonged Paroxysms (Rate 313 per Minute) in a Case of Acute Coronary Occlusion, with Recovery. Joseph Edeiken, M.D.

Sporadic Meningitis of Unknown Etiology. Hobart A. Reimann, M.D., and Alison H. Price*, M.D.

The Ballistocardiogram. Isaac Starr, M.D.

Erysipelothrix Rhusiopathia (Swine Erysipelas) in Swine and Man. Joseph V. Klauder, M.D.

*Regular Meeting, November 24, 1941*

The Etiologic Relationship of Dermatophytosis to Thromboangiitis Obliterans. Meyer Naide*, M.D.

Some Problems in the Diagnosis of Cancer of the Colon and Rectum. Abraham Trasoff*, M.D., and David Goodman*, M.D.

Physical Therapy and Its Relation to Internal Medicine. William H. Schmidt*, M.D.

Febrile Hyperthyroidism. Charles W. Dunn, M.D.

## SECTION ON MEDICAL HISTORY

*Meeting, November 10, 1941*

The History of Poliomyelitis. Pascal F. Lucchesi, M.D.

Influenza—Past and Present. Eugene P. Campbell*, M.D.

Contributions of Pediatrics to Modern Public Health Philosophy. Milton Rose*, M.D.

* *By invitation.*

*Meeting, December 8, 1941*

(Annual Students' Meeting)

Historical Aspects of Neurosurgery. Robert A. Groff, M.D.

The Development of Modern Urology. Stanford Mulholland*, M.D.

Some Contributions of American Surgery to the Art and Science of Medicine. I. S. Ravdin, M.D.

## SECTION ON OPHTHALMOLOGY[1]

*Regular Meeting, October 16, 1941*

Molluscum Contagiosum with Corneal Complications: Two Cases. Thomas A. Cowan, M.D.

Ocular Findings in Diabetes Mellitus, Controlled for Ten Years. Irving H. Leopold*, M.D.

Comparative Notes on the Superior and Inferior Oblique Muscles. William E. Krewson, 3d, M.D.

The Phenomenon of Misdirection of Regnerating Third Nerve Fibers: Its Surgical Correction. Edmund B. Spaeth, M.D.

*Regular Meeting, November 19, 1941*

(Fourth Annual de Schweinitz Lecture)

The Paths of Progress of Ophthalmology. Harry Friedenwald*, M.D.

*Regular Meeting, December 18, 1941*

Double Hemianopsia with Sparing of the Macula—Case of Bilateral Thrombosis of the Calcarine Arteries. P. Robb McDonald*, M.D.

Observations on the Obstacle to Squint Training—Amblyopia. J. B.

[1] The transactions of this Section are abstracted in the *American Journal of Ophthalmology* and the *Archives of Ophthalmology*.

Feldman*, M.D., and Annabel S. Taylor*, R.N.

## SECTION ON OTOLARYNGOLOGY[2]

*Regular Meeting, October 15, 1941*

EXTENSIVE CARCINOMA OF MAXILLARY ANTRUM. C. Calvin Fox, M.D.

TRAUMATIC PERFORATION OF THE FRONTAL SINUS WITH BRAIN ABSCESS. Philip A. Marden*, M.D.

MASSIVE OSTEOMYELITIS OF THE FACE AND SKULL. Samuel R. Skillern, Jr., M.D.

*Regular Meeting, November 19, 1941*

COMMENTARY ON LEONARDO DA VINCI'S CONTRIBUTION TO LARYNGOLOGY, RHINOLOGY AND PHONETICS. Charles J. Imperatori*, M.D.

THE OTOLOGIST AND THE HEARING AID PROBLEM. Walter Hughson, M.D.

*Regular Meeting, December 17, 1941*

RECENT EXPERIMENTAL STUDIES WITH DISEASES OF THE UPPER RESPIRATORY TRACT. Joseph Stokes, Jr., M.D.

PROTOZOAN ETIOLOGY OF THE COMMON COLD AND THE SPECIFIC PARASITE. William F. M. Hopkin*, M.D.

* *By invitation.*

[2] The transactions of this Section are abstracted in the *Archives of Otolaryngology.*

## SECTION ON PUBLIC HEALTH, PREVENTIVE AND INDUSTRIAL MEDICINE

*Meeting, October 6, 1941*

(Symposium on the Health of American Youth)

THE PHYSICAL CONDITION OF PHILADELPHIA PUBLIC SCHOOL CHILDREN AND THE CORRECTION OF EXISTING DISEASES AND DEFECTS. Walter S. Cornell, M.D.

DEFECTS IN COLLEGE FRESHMAN—HOW FOUND AND HOW DEALT WITH. H. D. Lees*, M.D.

THE HEALTH OF N. Y. A. YOUTH. William Egbert Robertson, M.D.

HEALTH FINDINGS UNDER THE SELECTIVE SERVICE EXAMINATION AND THEIR IMPLICATIONS. Leonard G. Rowntree, Col., Medical Corps, U. S. Army.

*Meeting, December 1, 1941*

(Nutrition in School Age Children)

CAUSES OF NUTRITIONAL DEFICIENCY IN PHILADELPHIA SCHOOL CHILDREN. Walter S. Cornell, M.D.

DIAGNOSIS OF NUTRITIONAL DEFICIENCIES IN CHILDREN OF SCHOOL AGE. Pauline Berry Mack*, M.D.

PANEL DISCUSSION: "HOW SHALL THESE PROBLEMS BE MET FROM A PUBLIC HEALTH STANDPOINT?" Discussors: Arthur P. Hitchens, M.D., Ernest L. Noone*, M.D., Joseph E. Beck*, Guy H. Bloom*, and Add B. Anderson*.

# President's Address*

*By* EDWARD B. KRUMBHAAR, M.D.

WITH our country now in a war to the finish, and the necessity for all of us to do our utmost to help bring it to a successful conclusion, we may be confident that the Fellows of this College, as in the first World War, will do their share worthily. Already many of them are on active service; 25 or more have requested and received the remission of dues authorized by Council. It is to be expected, and hoped, that many more will be applying for this privilege in the near future. Already at least three units organized in our hospitals have been ordered to active service, and the others are ready. Many Fellows are actively taking part, according to their capacities, in the preparations for civilian defense, and still others working on research problems requested by the government. With all this coming in addition to our peace time activities, those not so engaged will, as in the first World War, have to carry an additional burden—a burden as meritorious and in some cases more burdensome than that of those on active service. We all must also, I am sure, do our very best to preserve our peace time activities at a high standard.

I am glad to say that for the College these have progressed in the past year satisfactorily. The series of scientific lectures has been as good as any that we have had, as is reflected in the attendance (from 80 to 360). In addition to the 8 planned lectures, a Weir Mitchell Oration was given on Sunday, Nov. 30th, by Dr. R. D. Gillespie, Chief Psychiatrist of the Royal Air Force, on "Psychoneuroses in Peace and War." It continues to be regrettable, however, that there are relatively few Fellows to be seen in the audience. The lectures to the general public by Doctors H. R. Owen, R. A. Kern, and E. J. G. Beardsley have also been successful and well attended. Tonight we have heard the first lecture on the newly endowed Benjamin Musser Lectures on Clinical Medicine, which will further facilitate our efforts to offer high-grade lectures of practical as well as scientific value to the medical profession. This fall the innovation was made of having subscription dinners, in the President's room, before the lectures. Though somewhat slow in starting, these dinners are fulfilling their aim in bringing the Fellowship together and giving those attending a chance to meet and talk with the speaker of the evening. The first lecture of this fall, given by Dr. Bittner on "Experimental Breast Cancer," presented the substance of his work for which he had been awarded the Alvarenga Prize. Again the new method of awarding this prize has proved its usefulness.

The work of the five Sections has continued much as in previous years. Their present membership is recorded as follows: General Medicine, 115; Medical History, 44; Ophthalmology, 52; Otolaryngology, 57; Public Health, Preventive and Industrial Medicine, 53. Attendance at their meetings, as usual, has varied considerably—from 25 up to 200.

The Library, our other chief activity, has continued its excellent service in spite of the exigencies of European war-

* Read, January 7, 1942.

fare. Though the Committee's report will contain details of its activities, I know that you will want to hear something of its activities at least in a general way, especially in regard to foreign periodicals and books. The English literature, which is now handled directly with the British sources, has been coming uninterruptedly and satisfactorily. German books and periodicals have thus far been very well maintained, as they are forwarded to us through a Dutch agent. It is even possible, and to be hoped, that this will continue in spite of our now being openly at war with Germany. We have had nothing from the Italians for a year, but our subscriptions have been paid and the journals are supposed to be accumulating for us in storage. The arrival of the French literature, which stopped for many months, is now beginning to pick up again. While the attendance in the Reading Rooms has declined considerably, this is true also of other libraries, and happened the same way, for obvious reasons, in the last war. The Library was the fortunate recipient of two especially valuable collections, which are still continuing. Dr. Bradley's long-prepared collection of photographs of any works of art representing Philadelphia physicians has now reached fifteen stout volumes contained in a handsome case. This collection is especially valuable as it contains copies of many works that were in private hands. Dr. Sturgis' collection of medical engravings and original portrait photographs of medical interest, which has already assumed large proportions, has been given by him to the College and is still being added to. We are fortunate that Dr. J. P. Crozer Griffith, the eminent pediatrician whose memoir will soon be read by Dr. Hand, left our Library a bequest of $50,000 which becomes available to us upon the death of a life beneficiary.

Our *Transactions & Studies*, under Mr. McDaniel's able editorship, has amply proved the excellence of its new format in readability, promptness of appearance and economy of production.

The finances of the College are in as satisfactory a state as the present confused conditions permit. Acting on the advice of the Pennsylvania Company, our fiscal agent, our Finance Committee has made all its new investments and reinvestments for the past year in common or preferred stocks, thus reducing our over-large percentage of bond holdings. Also the high percentage of railroad securities has been reduced. Our capital, exclusive of real estate and mortgages, amounts to $504,700, with an annual income of $26,700 (yield, 5.3%).

We now have 660 Resident, 45 Non-resident, and 8 Honorary Fellows, having lost by death, 10 Resident and 3 Non-resident Fellows, and one by resignation, in the past year. We have elected 40 new Resident and 1 Non-resident members.

Through its Council and its special committee the College has taken an increased interest in public affairs affecting medicine. When the Selective Draft was being arranged, our recommendation to the President and the three Surgeon Generals that medical students and interns be placed in a deferred class was appreciatively received by these officials. Our Committee on Public Health continues to meet jointly with the corresponding committee of the County Medical Society under joint chairmanship. About a year ago they made an important contribution to the Byberry study, which was followed by considerable improvement in that institution. They

are now studying the suggestion that viable premature births should be reported within two hours, in order to lower the premature death rate; also the proposition that domestic employees should be submitted to health examinations; also the sewage pollution of the Delaware River Basin, a better city water supply, the smoke nuisance, and similar problems.

Last spring I appointed a Committee, under Dr. Custer's chairmanship, to study the relative merits of the Coroner's office and the Medical Examiner's system. Before the fall city elections the Committee addressed a questionnaire to the two candidates and received a satisfactory reply from Dr. Goddard, our present Coroner. The publicity given this correspondence by the Republican party was said to have been the chief reason that Dr. Goddard ran well ahead of his ticket. With a physician, who incidentally is a Fellow of this College, as Coroner, we may reasonably hope that the work of that office will be greatly improved in the near future, and that thus a better comparison will be possible of the merits of the two systems.

Your officers are at present actively taking part in a concerted effort to get City Council to revise upward the 1942 budget of the City Department of Health according to a Resolution passed by our Council at its last meeting.

Several improvements have been brought about in the administration of the College. According to a recent change in the By-Laws, voting for College officials and candidates for Fellowship may today, for the first time, be done by mail as well as in person. It is hoped that in this way a much larger percentage of the Fellowship will avail themselves of the voting privilege than formerly, and that the results will more accurately reflect the will of the Fellows.

You have also placed in Council's hands the responsibility of determining the dates of business meetings. As a result, this meeting tonight was held the same evening as the January scientific meeting, an experiment which can now readily be abandoned if it should prove undesirable.

The lecture rooms of the College have been used, as in the past, for the meetings of our own Sections and affiliated societies. In addition, Mitchell Hall was also opened to the Woman's Medical College for their Commencement exercises last spring, thus providing a dignified and most appropriate background for such an occasion. Their appreciation of this fact shortly became apparent when they most generously presented us with a magnificent incunabulum of medical interest—the *Speculum doctrinale* by Vincent de Beauvais. The Woman's Medical College have also been allowed the use of our halls for a series of endowed lectures on heredity, to be preceded by small dinners in the President's room. The use of Mitchell Hall by the American Association for the Advancement of Science a year ago proved satisfactory, and was gratefully acknowledged.

### NECROLOGY

Memoirs of Dr. Thomas R. Neilson and Dr. David Riesman were read by Drs. Mutschler and Fitz-Hugh, respectively, at the Business Meeting in January[1]; a memoir of Dr. Robert G. Torrey was read by Dr. Schnabel at the May meeting[2]; one of Dr. Arthur Newlin by

[1] Both printed in the *Transactions & Studies*, April, 1941.

[2] *Transactions & Studies*, June, 1941.

Dr. Packard at the October meeting[3]; and one of Dr. Henry K. Mohler by Dr. Shallow at the December meeting[4]. Memoirs of Drs. James E. Talley and J. P. Crozer Griffith are shortly to be read.

In addition I regret to have to record the deaths of the following Fellows:

*Nelson J. Burden*, elected a Fellow October 2, 1935; died of brain tumor, aged 39, on January 31, 1941. A graduate of the University of Pennsylvania School of Medicine in 1925, he acted as Assistant Instructor of Pathology there from 1926 to 1932, and from 1931 to 1935 was Student Health Physician.

*A. Graeme Mitchell*, Non-resident, one of the most distinguished American pediatricians, elected a Fellow in November, 1917; transferred to Non-resident Fellowship in 1924; died of coronary disease June 1, 1941, aged 52. A graduate of the University of Pennsylvania School of Medicine in 1910, he taught there and practiced pediatrics from 1912 to 1924, when he was appointed Professor of Pediatrics at the University of Cincinnati College of Medicine. A member of the chief pediatric societies of the country, and of the National Board of Medical Examiners, he contributed his services freely to philanthropic medical activities. He was connected with three Cincinnati Hospitals and for four years was a member of the City Board of Health. In the World War he served with the 42nd Division at St. Mihiel and in the Argonne, was Adjutant of Hospital Unit A and Superintendent of the Civilian hospital at Neufchateau. He was a prolific writer of medical articles and co-author with J. C. P. Griffith of a "Textbook of Pediatrics" (3 ed., 1941); also Associate editor of the *American Journal of Diseases of Children*, and of Sajous' "Cyclopedia of Medicine." Dr. Mitchell's rare qualities easily elude a brief obituary notice. His keen sense of humor and command of the spoken word made him an excellent raconteur, teacher and presiding officer. His constructive interest in art—contributing as well as collecting—is revealed in his well executed watercolors and engravings, and a good collection of more than 100 medical caricatures from Teniers to Daumier. His kindliness and uncompromising integrity—a rare quality today—made him a friend indeed.

*John J. Shaw*, elected a Fellow March 5, 1941; died June 24, 1941, of coronary occlusion, aged 57. A native of Providence, R. I., he was a graduate of Brown University and of the University of Pennsylvania School of Medicine (1908). Early associated with Drs. John B. Deaver and Ellwood Kirby, he was appointed Secretary of the Pennsylvania Department of Health (1939) by Governor James, and proceeded rapidly to inaugurate a brilliant series of improvements which, if they had not been interrupted by his untimely death, would have gone far to place this state in the lead in public health matters. For this achievement he was awarded the County Medical Society's Strittmatter award (1940); and the American Public Health Association presented him with a scroll attesting to his public health achievements (1941). He was given the honorary degrees of Doctor of Science (University of Pennsylvania, 1941) and Doctor of Public Health (Temple University, 1941).

*Henry Barr Ingle*, elected a Fellow October 6, 1937; died August 10, 1941 of myocarditis, aged 63. A graduate of the University of Pennsylvania School of Medicine, 1902; he served his country

[3] *Transactions & Studies*, December, 1941.
[4] *Transactions & Studies*, February, 1942.

during the World War, and was on the staff of the National Stomach Hospital and at one time medical superintendent of the Diagnostic Hospital.

*Isador Kaufman*, elected a Fellow January 11, 1926; died August 11, 1941, aged 59. A graduate of the University of Virginia Medical School (1904), and a tuberculosis specialist, he was a Fellow of the American College of Physicians; and a member of the staffs of the Abington Memorial Hospital, the White Haven Sanatorium, and the Kensington Dispensary; he lectured at the University of Pennsylvania and formerly was associated with the Henry Phipps Institute.

*E. Hollingsworth Siter*, elected a Fellow December, 1902; died September 5, 1941 at York Harbor, Me., aged 73. A graduate of the University of Pennsylvania School of Medicine (1897), he taught genito-urinary surgery at his alma mater and served in various capacities on the staff of the University Hospital and the Philadelphia General Hospital. He served in the World War and was a Fellow of the American College of Surgeons.

*Henry Norris*, of Bryn Mawr, Pa., elected November, 1901, to Non-Resident Fellowship; died October 6, 1941, aged 66. A graduate of the University of Pennsylvania School of Medicine, Dr. Norris built a hospital in Rutherford, N. C., where he worked with Dr. Biggs until he retired about 10 years ago and moved to Pawleys Island, S. C., where he died. In the World War he served overseas with the 30th Division, in the 105th Engineers, as Surgical Consultant, and as Division Surgeon. He was a member of the Medical Society of the State of North Carolina and a Fellow of the American College of Surgeons.

*William H. Bell*, U. S. N. (retired), elected a Fellow June, 1916; died November 11, 1941 of cerebral arteriosclerosis and pneumonia, aged 68, at Chevy Chase, Md. A graduate of the University of Pennsylvania School of Medicine (1897), he entered the Navy in 1898, advanced through various grades, and was retired on application January 1, 1936, with the rank of Rear Admiral. He was head of the naval Division of Preventive Medicine in the Bureau of Medicine and Surgery. He was a delegate to the International Bureau of Documentation on Military Medicine, Liège, Belgium, in 1932; first editor of the U. S. Navy Medical Bulletin, when it was established in 1907; member of the House of Delegates of the American Medical Association in 1907; fellow of the American College of Surgeons.

# Annual Report on the Library*

When the war is over, there will be time and reason to review its effect upon the library. That effect to date may be partially seen in the statistical section of this report. Meanwhile, even though we are at war and laboring to contribute as best we may to the maintenance of dissemination of scientific knowledge, we shall perhaps be wise not to absent ourselves entirely from thoughts of future developments in the medical-library world—developments which may, for all we know, be greatly hastened and otherwise influenced by temporary exigencies of the war itself.

Several more or less obvious factors govern the future of the large medical library. Most prominent among them are finances, the library's relationship to the community, and the rapidity with which medicine develops, both horizontally and vertically.

*Finances.* All of our major medical libraries—except the greatest, the Army Medical Library—are the end- or by-products of private medical organizations. They are supported by appropriations from the organizations and by endowments provided directly or indirectly by members of the organizations. The amount of the annual appropriation rests on the total amount available to the institution, the amount of income available to the library from its endowed funds, and on the ruling opinion as to the value of the library to the institution. The number and the size of the endowments rests obviously on the zeal displayed by past and present members of the institution. As a rule, a library becomes great, and maintains its greatness, through endowments rather than by means of the annual appropriation made to it.

*Relationship to the Community.* Despite the fact that they were originally planned as one of the advantages accruing to membership in the associations concerned, our large medical libraries as they became great became also, in good American fashion, generally accessible to the medical, and even the lay, public at large—to such an extent that today they are, as a rule, less frequently used by members of the institutions that support them than they are by others. They are, in fact, public libraries privately supported. They have become distinct practical and cultural assets not only to their immediate communities, but to the country as a whole, since by means of inter-library loans, reproduction and bibliographic services their resources are put within reach of any one anywhere. Even with these services, it is cause for concern, from a larger point of view, that along a strip of the Atlantic seaboard not so deep as a well nor so wide as a church door there is concentrated the greatest collection of medical literature in the world.

*Development of Medicine.* Meanwhile, medicine itself tends constantly to extend its intellectual horizon and to stratify its investigations within single fields. The concept of the relationship between medicine and human activity broadens, while the techniques of discovery and application multiply so rapidly that we have what appears to be a mass of contiguous but almost independent cells. The task of the research medical library has been, as was said in one of our earlier reports,

* October 16, 1940–October 15, 1941.

to meet "the needs not only of the general practitioner and the medical and surgical specialists, but also those of a host of workers in channels contributing to the main stream. We have, finally, to see that the fruits of the past are not lost in the turbulent and self-centered currents of the present. We have to attempt the impossible—to be all things to all men working in the medical sciences." The poor general practitioner, whose number is sometimes said to be up, is not alone in his grief. It is possible that the time is not far off when the large medical library, too, will be forced to follow the lead of medicine—demarcate and consolidate.

*Preview.* This, then, is the situation in brief: our major medical libraries are concentrated on a short strip of the Atlantic seaboard; they are, in practice, public institutions privately supported; they attempt to cover as much as possible of the whole range of current and historical medical literature, and, in addition, to provide supplementary services essential to research.

Two thoughts immediately present themselves: one, that a public institution ought, in part at least, to be supported by public funds; the other, that community and inter-community medical-library cooperation might, and indeed is likely to, furnish the answer to some of the problems which already confront us. As function governs the economic need, it is to a consideration of our present and possible future function that we now turn our attention.

There are in the Philadelphia area 23 medical libraries. It must be accepted that the prime function of each of these is to serve the needs of those who support them. It may likewise be accepted that none of these libraries, with the exception of this one, attempts to serve any others to an appreciable extent. Unquestionably there is a considerable amount of duplication in purchases of books and periodicals—but the greater part of this is inevitable and quite defensible in a broad area where large and widely-scattered groups are working as independent units, and when time is, or seems to be, of the essence. This library alone, in this area, ventures beyond the confines of the current "working" library into the vast outer reaches of medical literature.

The function of this library has hitherto been construed idealistically as that of providing everything in the literature from A to Z. Failing, naturally, to come anywhere near achieving the ideal, we have merely done the best we could, without setting any well-defined goals, without attempting, through coöperation with the other libraries, to ensure for the medical profession in the community a reasoned and systematic coverage of the literature. It may be questioned whether "the best we can do" can much longer be accepted as good enough. Already it is clear that the collections are coming to resemble a series of closely parallel dotted lines and that, with medicine and funds expanding at an unequal rate, the intervening spaces between the dots will increasingly loom larger. Would it perhaps be better for the collections to be represented by more widely-spaced, but unbroken lines, with the knowledge that the missing lines would be found intact elsewhere when needed?

If we could look, say, 15 or 20 years into the future, might we not see our Philadelphia medical libraries functioning somewhat as follows:

The County Medical Society library would be providing all of the important medical periodicals, standard texts, and reference works in the English language. The school and hospital libraries would

be consulting, as commonly at present, only the immediate and primary needs of their constituents. The College of Physicians library would be providing all of the major foreign periodicals and such of the lesser ones as were allotted to it by agreement with the large medical libraries in near-by cities; the best foreign texts and reference works; the more expensive or limited-in-appeal works in the English language, as well as the English-language periodicals of minor importance; historical and biographical works. The library of the College would have supplied the other libraries with a checklist of its current-periodicals holdings; it would be cataloguing books for all the other medical libraries in the area at cost, furnishing each of them with author and subject cards (containing the symbol of the library owning the book) for every book. Each of the libraries would thus be developing its own author and subject catalogue of the current medical literature available in the area, while, between them, the College's catalogue and the Union Library Catalogue would supply a partial subject- and a complete author-catalogue of the older literature available. The College library would be serving as a center for information on medical publications and for historical research.

If, 15 or 20 years from now, we see in actual operation some such phenomenon as this, the details of which could easily be amplified, what will have been the intervening steps leading to the consummation? First, we shall ourselves have faced the situation realistically, realizing that no amount of money conceivably forthcoming could possibly achieve the old ideal; that the close proximity of other great medical libraries would make even the attempt to achieve it unnecessary on any practical ground. The Fellows, having already the tradition of regarding the library as a community rather than as a private asset; having access, all of them, to the County Medical Society library, and, many of them, to the school and hospital libraries, will have chosen, in the general interest, to have their library outstanding in a restricted number of collections rather than mediocre in an unlimited number.

Second, the County Medical Society, the voice of some 2500 physicians, recognizing the opportunity to increase the value of its services through such a cooperative enterprise, will have obtained funds sufficient to establish and maintain a library of such a sort as is outlined above. Nothing that is logical is impossible, provided it be well fortified with enthusiasm.

The years of war, and the after years, have doubtless many tribulations in store for us; but as far as our libraries are concerned, and not the medical libraries alone, the course is already set. The worst that can come will merely hasten the trend toward library coöperation, for through it knowledge, which helps to make men free, is more quickly and economically passed on.

## Inventory

| | 1941 | 1940 | 1941 | 1940 |
|---|---|---|---|---|
| *Total number of accessioned items*[1] | | | 157,525 | 154,822 |
| Incunabula | 412 | 411 | | |
| Manuscripts | 540 | 538 | | |
| Other items[2] | 156,573 | 153,873 | | |
| | 157,525 | 154,822 | | |
| *Total number of unaccessioned items*[3] | | | 320,986 | 319,858 |
| Reports and Transactions | 25,623 | 25,594 | | |
| Periodicals "reserve"[4] | 4,659 | 4,636 | | |
| More or less complete volumes of other periodicals not regularly received | 2,867 | 2,975 | | |
| Theses and Dissertations | 47,301 | 47,026 | | |
| Pamphlets (less than 100 pages) | 240,536 | 239,627 | | |
| | 320,986 | 319,858 | | |
| Total number of current periodical publications regularly received | | | 1,029 | 1,134 |
| Duplicate books | | | 13,998 | 13,612 |
| Portraits[5] | | | 52,070 | 46,943 |

## Distribution of this Material

| | Accessioned items | Unaccessioned items |
|---|---|---|
| General Library (including the Lewis Library) | 153,308 | 320,982 |
| On permanent deposit: | | |
| Gross Library | 3,801 | 4 |
| Parry Library of the Obstetrical Society of Philadelphia | 217 | 0 |
| Mütter Museum[6] | 199 | 0 |
| | 157,525 | 320,986 |

[1] An accessioned item may be any kind of graphic material that is kept within covers, whether these be made commercially or in the library, of paper or of more durable material. The accessioned item might comprise, for instance, part of a book, or one or more books; a part of a periodical volume, or one or more complete volumes; reports, pamphlets, or theses, single or collected; an atlas or photograph album.

[2] Including 39 'rare' books acquired during the year.

[3] While the accessioned items contain some material in paper covers, it should be noted that most Reports and Transactions, pamphlets, and theses, also paper-covered, are not accessioned, but that all might be at any time, if any intrinsic reason for so doing should present itself.

[4] More or less complete duplicate volumes of important and much-used periodicals.

[5] Including 107 oil, and 458 other, framed portraits in the care of the Committee on College Collections. The count of portraits represents the number of entries on the cards in the portrait catalogue. The entries represent, in turn, both loose portraits and those in books, many of them, of course, being merely different reproductions of a single original.

[6] The books of the Mütter Museum are not permitted to be removed from the College building.

## Current Periodicals

*Total number of periodicals regularly received in the library:* 1,029 titles

| | *Purchase* | *Exchange* | *Gratis* | *Annuals & 'Books'* | *Total (1941)* | *Total (1940)* |
|---|---|---|---|---|---|---|
| American (United States) | 158 | 70 | 154 | 44 | 426 | 416 |
| Australia and New Zealand | 1 | 3 | 1 | 2 | 7 | 7 |
| Belgium* | 6 | 1 | 0 | 0 | 7 | 22 |
| British Isles | 71 | 16 | 6 | 2 | 95 | 99 |
| Canada | 1 | 7 | 6 | 1 | 15 | 15 |
| Ceylon and India | 2 | 5 | 1 | 0 | 8 | 9 |
| Cuba and Puerto Rico | 0 | 6 | 5 | 0 | 11 | 14 |
| France and Colonies* | 57 | 5 | 0 | 0 | 62 | 119 |
| Germany* | 151 | 0 | 0 | 8 | 159 | 162 |
| Italy** | 79 | 6 | 2 | 0 | 87 | 105 |
| Japan, Korea, Manchoukuo | 2 | 7 | 5 | 1 | 15 | 25 |
| Mexico and Guatemala | 0 | 7 | 8 | 0 | 15 | 10 |
| Netherlands and East Indies* | 11 | 1 | 1 | 0 | 13 | 13 |
| Philippines | 1 | 4 | 1 | 0 | 6 | 5 |
| Scandinavia* (Denmark, Norway, Sweden) | 14 | 4 | 0 | 0 | 18 | 17 |
| South America | 4 | 18 | 19 | 2 | 43 | 42 |
| Switzerland* | 21 | 2 | 1 | 0 | 24 | 25 |
| Miscellaneous† | 2 | 10 | 4 | 2 | 18 | 29 |
| Totals, 1941 | 581 | 172 | 214 | 62 | 1,029 | 1,134 |
| Annuals & 'Books' | 21 | 15 | 26 | 62 | | |
| Grand Totals, 1941 | 602 | 187 | 240 | | 1,029 | |
| Grand Totals, 1940 | 645 | 230 | 259 | | 1,134 | |
| Grand Totals, 1939 | 688 | 248 | 266 | | 1,202 | |

* Continental European journals have been counted as "current" if any issues dated October 1940 or later have been received in the library—the period since the last previous census. Nine German *Zeitschriften* are included whose latest issue received, though reaching us only late in 1941, is dated July, August, or September 1940.

** Italian subscriptions ("purchase") have not been received since the summer of 1940, but are listed as current because they are being stored (through 1941) for later delivery. No Italian exchange journals have reached us since August 1941.

† Fewer than 6 journals each from: British Africa (3), China (4), Jugoslavia (1), Lithuania (1), Roumania (2), Russia (4), Siam (1), Spain (2).

Again this year, the words "current" and "regular" must be understood to apply to most European journals (except the British) only in a relative sense. Shipments from the continent continued to reach us from our agent in Amsterdam as late as January 9, 1942, but not all of this material bore a 1941 publication date. Of 145 journals included in the census a year ago but omitted from the present report, only 9 are known to have admittedly ceased (or suspended) publication; but the same is almost certainly true of many others about which no information has yet been received. Another group omitted from the census consists of 42 publications issued not more than once annually, and not received during the past 12 months. One or more numbers of 198 other journals (all but 21 of them published in the Western hemisphere), also not included in the tabulation, were added to the files, scattered issues (current or otherwise) having been received by donation.

*New titles:* Of the 28 publications added to our list during the year, 16 are received by purchase; 3, by exchange; 9, gratis. Nineteen of these are journals which have recently begun publication and are now on file from the first number issued.

*Separate issues* received and filed: 12,428 (exclusive of duplicates, 2,149, and of reserves, 271)—a total 750 greater than the year before, but 2,050 fewer than in 1939. These totals show the considerable effect of the war on the number of issues received; but the drop in the number of duplicates (scattered issues received by donation from Fellows and other local sources) has been even greater—

from 6,200 in 1939 to 4,700 in 1940, and now to 2,149 in 1941. Of the total number (12,428), 2,623 were scattered issues received from Fellows and other donors—about 100 more from these sources than were filed in 1940; and 109 others were previously-lacking back-numbers supplied by publishers or editors in response to claims. Still another group of 90 numbers consisted of issues supplied by our European agent to replace lost or missing back numbers of foreign subscriptions, chiefly of 1939 or 1940 publication-date.

*Visitors* to the Current-periodicals Room during the year were recorded to the number of 5,781, a decrease of 979 from the number for the preceding year. Of this year's total, some 1,020 were visitors during the 70 evenings the library was open (150 persons fewer than the year before); and 330 were visitors on 35 Sunday afternoons.

## Readers' Use of the Library

*Library hours:* the library was regularly open daily, except Sunday, from 9 to 6; on Wednesday and Friday evenings until 9:30; on Sunday afternoons from 2 to 5:30 (October 7, 1940 to June 8, 1941). From June 9 to September 5, incl., the library was open Mondays to Fridays, incl., from 9 to 4:30, and closed on Saturdays and Sundays. The library was closed the week of August 4, and, as usual, on the following legal holidays: Thanksgiving, Christmas, New Year's, Independence, and Labor days.

| | | | *Non-Fellows* | | *Fellows* | | *Totals* | |
|---|---|---|---|---|---|---|---|---|
| | *1941* | *1940* | *1941* | *1940* | *1941* | *1940* | *1941* | *1940* |
| *Number of visitors:* | | | | | | | | |
| Days | (289) | (294) | 7,640 | 9,130 | 1,607 | 2,026 | 9,247 | 11,156 |
| Evenings | (70) | (76) | 1,255 | 1,634 | 180 | 225 | 1,435 | 1,859 |
| Sundays | (35) | (18) | 610 | 443 | 35 | 27 | 645 | 470 |
| | | | 9,505 | 11,207 | 1,822 | 2,278 | 11,327 | 13,485 |

| | *1941* | *1940* |
|---|---|---|
| *Circulation of books:* | | |
| Number of volumes taken out | 7,768 | 8,379 |
| (Books: 3,628; Periodicals: 4,140) | | |
| Number of volumes consulted in the library‡ | 44,825 | 50,520 |
| (Books: before 1700, 226; before 1850, 489; 1850–1899, 11,745) | | |
| (Periodicals: before 1850, 439; before 1899, 1,316; after 1899, 30,610) | | |

‡ The number of volumes "consulted in the library" includes only those supplied on demand. Readers have access to the bound volumes of periodicals and works of reference kept on the shelves in the Reading Room; the Fellows of the College, and occasionally others by special permission, have access to the book-stacks. There are, therefore, many volumes consulted of which no accurate record can be kept.

*Inter-library Loans:* The library has sent 141 (1940: 117) volumes on inter-library loan to 24 (1940: 25) libraries in 16 (1940: 12) States, and has borrowed 14 (1940: 19) volumes from 6 (1940: 5) libraries. There were, as happens each year, a number of requests we could not fill: 17 volumes asked for we did not have; 3 are on the restricted list; 8 requests were for current, unbound journals. Our photostat answered the need in some of these cases, and in many more a knowledge of this service obviously forestalled a request for loan of a volume. Our borrowings were chiefly from the Army Medical Library, but the library of Columbia University, the technical library of the Edgewood Arsenal, the Library of Congress, the library of the University of Wisconsin, and the Welch Medical Library also graciously answered requests for loans.

*Photostats:* 1,345 photostatic prints have been furnished to Fellows (1940: 917); 482 prints to non-Fellows (1940: 553); 855 prints to the library. The last include a copy of an incunabulum (bringing the total of photostated incunabula to 315), portraits, rare books on loan, etc.

## Acquisitions and Accessions

*Received from all sources:*

1941: 3,215 volumes (including the bound and accessioned volumes of periodicals, 65 unbound reports and 447 duplicates); 1,915 pamphlets; 430 theses; 16,203 numbers of various journals.

1940: 3,118 volumes (including the bound and accessioned volumes of periodicals, 99 unbound reports and 651 duplicates); 3,137 pamphlets; 2,381 theses; 21,525 numbers of various journals.

*Accessions:*

1941: 2,703 volumes (1,067 by purchase; 1,015 by gift; 621 by exchange).
(Books, 902; Periodicals, 1,801).

1940: 2,368 volumes (978 by purchase; 701 by gift; 689 by exchange).
(Books, 702; Periodicals, 1,666).

### Donations

The individual donors for the past year number 248 (1940: 290).

The library is indebted for large gifts of books, pamphlets, and unbound periodicals to the following donors:

P. Blakiston's Son & Co.; Drs. H. P. Brown, Jr., Burton Chance, W. A. N. Dorland, A. A. Eshner, R. J. Hunter, J. H. Jopson, E. B. Krumbhaar; Lea & Febiger, Medical Library Association; Drs. E. J. Morris, F. D. Patterson; W. B. Saunders Co.; Drs. J. D. Seiberling, E. H. Siter, Walter Susserman; University of Pennsylvania Library; Drs. Joseph Walsh, G. B. Wood.

Various publishing houses have presented volumes as follows: F. A. Davis Co., 18; Lea & Febiger, 14; J. B. Lippincott Co., 11; W. B. Saunders Co., 41; Principia Press, 1; G. E. Stechert & Co., 1.

Twelve volumes were presented by the following authors or editors: Lockwood Barr, Reuben Friedman, C. E. Heaton, E. B. Krumbhaar, S. E. Massengill, C. Mazer & S. L. Israel, Merrill Moore, J. L. Rice, J. H. Stokes and H. Beerman, Homer Wheelon.

One book was sent from the publisher at the request of the following author: S. A. Loewenberg.

### Exchanges

The *Transactions & Studies* was sent, either as gift or in exchange for 303 other serial publications, to 346 organizations.

One hundred and fourteen distributions (4,906 unbound journals) have been made through the Medical Library Association Exchange. The library has received forty-two such distributions.

Theses and dissertations to the number of 89 have been received from the following European Schools of Medicine with which we exchange publications at the present time: Universities of Bern, Lausanne, Lund, Tartu.

## Work of the Cataloguers

| | *1941* | *1940* |
|---|---|---|
| Number of works classified, shelf-listed, and for which cards were filed | 859 | 555 |
| Cards typewritten, examined and filed | 9,680 | 12,189 |
| Other cards altered and filed | 10,671 | 11,402 |
| Pamphlets and reprints subject-headed and arranged alphabetically by subject, and by author under the subject | 884 | 1,788 |

## Miscellaneous Notes

*Exhibits.* The major historical exhibits of the year comprised one on war medicine; on cancer, Papyrus Ebers to radium therapy; on syphilis in bone, prepared with the authoritative coöperation of Dr. R. C. Holcomb; on medical etchings, drawn from the new Sturgis collection mentioned below. There were smaller exhibits, as usual, for each of the meetings of the Section on Medical History.

*Art Collections. Dr. Samuel B. Sturgis* made magnificent progress in his work on the collection of medical art. He mounted and carefully described over 2000 prints, which are now being indexed as his work proceeds. *Dr. William N. Bradley* presented his 15-volume, beautifully bound collection of photographs of works of art dealing with Philadelphia physicians. The collection, a work of many years, contains photographs of many art works in private hands, and thus little known, affording a unique source of reference for unusual illustrative material.

*Rariora.* Notes on Vincent of Beauvais' *Speculum doctrinale*, Nuremberg, 1486, and a 13th c. manuscript of Galen's

*De crisibus*, two especially valuable acquisitions of the year, appear in the December, 1941, issue of the *Transactions & Studies*. Other acquisitions of historical interest remain to be recorded. From *Dr. Samuel Bradbury* came two 19th c. German cholera caricatures and a Hartford, 1832, printing of the "Pocket Lavater," one of the numerous popularizations of that writer's physiognomical theories. Another piece of Americana medica, the gift of *Dr. George B. Wood*, was a copy of "The Family Adviser," N. Y., 1833, by Dr. Henry Wilkins, "one of the trustees of the University of Maryland." *Dr. John Stewart Rodman* gave us a copy of the rare 1651 edition of Helkiah Crooke's "Micrographia," and of S. G. Morton's "Human anatomy," 1849. From *Dr. Samuel X. Radbill* came, among other gifts, an Italian translation of a work originally written in German by a Frenchman, C.-C.-H. Marc, on the recognition of poisons in the human body ("Riflessioni generali intorno ai veleni . . .," Naples, 1805). No copy of the work in any language is listed in the *Index-catalogue* of the Army Medical Library. *Dr. Samuel B. Sturgis*, director of our collection of medical art, was the donor of a copy of the Amsterdam, 1722, edition of Eustachius' "Tabulae anatomicae," which is additionally interesting as an example of *dos à dos* binding.

The Hippocrates, Galen, and Galeno-Hippocrates literary corpora are so vast that no library can afford the complacent feeling that it is able to satisfy every requirement of students of these masters. Even the quasi-definitive works of Kühn, Daremberg, Littré, *et al.*, do not remove the necessity on occasion of consulting the early texts. Therefore, when the opportunity of adding one more of them to our historical collection presents itself, we take advantage of it. An acquisition of this sort is the *Galeni in Hippocratis Librum de humoribus commentarii tres*, published at Venice, by Valgrisius, in 1562. The little volume, containing also Galen's 6th, 7th, and 8th commentaries on the 6th book of Hippocrates' *De vulgaribus morbis*, is of especial value to our collection in that we do not have this translator's (G. B. Rasario) edition of the Galen *Opera omnia*, issued in the same year by the publisher of our volume.

Two other works of historical interest came from an unexpected source—a young medical student, *John J. B. Light*, on the day before he joined the armed forces. A frequent user of the library, and with his future uncertain, he wished it to have such of his historical books as it might not already have. We owe to him copies of J. S. Carl's *Medicina pauperum oder Armen-Apothek* (not listed in the *Index-catalogue*), Büdingen, 1719; and Johannes Juncker's *Conspectus medicinae . . .*, Halle, 1718, bound with the author's *Conspectus chirurgiae . . .*, Halle, 1721, the former of which had not been available in the library.

*Dr. W. A. N. Dorland* presented a Siamese book, about which we have no data at present. From the estate of Phillippus Miller came the manuscript charter, dated January 10, 1888, of the Gynecean Hospital of Philadelphia. *Dr. Burton Chance* and *Dr. Francis R. Packard* each donated a number of interesting medical prints and portraits.

*Division of catalogue*. During the year, the library carried out, with the approval of the Library Committee and at the suggestion of one of its members, Dr. Edward A. Schumann, a division of the major subject classifications in the catalogue into works printed before 1900 and after 1899, thus facilitating the use of the catalogue by two groups of users.

*Union List of Serials*. The lengthy and

complicated task of checking our periodicals holdings for the new edition of the Union List of Serials was completed during the year. Owing to the fact that the work was carried on at different times by different hands, we have no great confidence that the task was achieved with the degree of accuracy or completeness we would have liked; but at least a considerable part of the library's holdings will be represented for the first time in this invaluable tool of scholarship.

*Publications.* Historical articles based on material in the library were published in the December, 1940, April and June, 1941, issues of the *Transactions & Studies*, and a brief account of the library appeared in the December, 1940, issue of the *Bulletin of the Special Libraries Council of Philadelphia and Vicinity*.

*Coöperation with Other Libraries.* The library met all the obligations attendant upon membership in the national Medical Library Association. In addition, it became a charter member of the new Philadelphia Metropolitan Library Council, the librarian serving as chairman of the Committee on Constitution and as the first elected vice-president.

*The Staff.* The librarian read papers before a section of the Special Libraries Council of Philadelphia and the Medical Library Association (the latter paper being published in the Association's *Bulletin*, October, 1941); attended the meetings of the American Association of the History of Medicine and the opening of the Historical Library of the Yale University School of Medicine. He was appointed lecturer in the history of medicine, Graduate School of the University of Pennsylvania.

The membership of the loyal and efficient staff of assistants remains unchanged from that noted in our last report, except that Mrs. Lundquist was succeeded, on June 30, by Mrs. John Toms, and John Jackson resigned in January, on completion of his studies at the University of Pennsylvania; he has not been replaced.

W. B. McDaniel, 2d
*Librarian*

Approved for Publication:

William Egbert Robertson, M.D.
*Chairman*

# Reports of the Committees on the Mütter Museum and College Collections

## The Museum

The Museum was open to Fellows and guests, on days when the College Building was open, from 10 to 1, and from 2 to 6, except Saturdays, when the hours were from 9 to 1. During these hours the clerk-technician, Mrs. Wade, was constantly in attendance. In addition, the Museum was open on the evenings of the Stated Meetings of the College and on the occasion of the lectures for the General Public, the clerk-technician being in attendance. At the request of some of the Sections of the College, the Museum was open for an hour or two before certain of their meetings.

The clerk-technician reports more than 1000 visitors registered during the year. There were, of course, visitors to the museum who failed to sign the Register. The increased number of visitors, Fellows and others, during the year would appear to indicate a growing interest in the Museum. This is, in large measure, due to the courtesy and constant attendance of the present clerk-technician.

The Committee wishes to express its appreciation of the attention and interest shown by the curator of the Museum, Dr. Joseph McFarland. The coördination of his efforts with those of the Committee has proved valuable.

The Thomas Dent Mütter Lecture LIII was given by Allen O. Whipple, M.D., Professor of Surgery, College of Physicians and Surgeons, Columbia University, who spoke on "Recent Studies in the Circulation of the Portal Bed and of the Spleen in Relation to Splenomegaly."[1]

The Accessions Catalogue of three volumes was completed during the year. This catalogue contains the record of more than 6837 items. Data are now available on nearly all the specimens in the Museum. In many instances specimens are associated with the names of prominent members of the College, past and present. The Committee is grateful to the curator and the clerk-technician for the careful work they did on this Catalogue.

Certain of the collections of the Museum were used for teaching purposes during the year by some of the medical schools of the city.

A considerable number of objects from the storeroom, including instruments and the like, were labelled, catalogued and placed on display in the Museum.

Dr. Joseph McFarland was reappointed curator of the Museum for the year 1941–42, and Mrs. Ella N. Wade was appointed clerk-technician for the year 1941–42.

Accessions to the permanent Collection of the Museum and subject to the Mütter Deed of Gift, during the year, were as follows[2]:

(1) Utility syringe that belonged to Howard W. Lewis. Manufactured sometime between 1857 and 1881. Presented by Mrs. Mabel Potter Lewis, June 1941.

(2) Set of cupping instruments, containing two scarificators and spirit lamp and 26 cupping glasses. Presented by Dr. W. E. Chamberlain, Nov. 17, 1941.

[1] Printed in the *Transactions & Studies*, 1940–41, **8**, 203–217.

[2] For further acquisitions during the year, see the *Transactions & Studies*, 1941–42, **9**, 126–7.

## College Collections

The new catalogue of the College Collections contains 1061 records of data pertaining to the Collections. The catalogue is now available for general reference.

Dr. Joseph McFarland was reappointed Curator of College Collections for the year 1941–42 and Mrs. Wade, clerk-technician.

Accessions to the College Collections were:

(1) Seal of the Gynecean Hospital. Presented by Mrs. Richard Tunis from the estate of her father, Phillippus W. Miller, Feb. 25, 1941.

(2) Oil portrait of Dr. Thomas Tickell Hewson, President of the College of Physicians from 1835 to 1848. Painted by Sully. Presented by Dr. William Hewson, Jan. 24, 1941 for the children of Addinell Hewson, Jr., M.D., deceased.

J. Parsons Schaeffer, M.D.
*Chairman*

# List of the College Lectures, 1941

SCIENTIFIC LECTURES

*January 8*

FRANCIS, THOMAS, JR. The Problem of Epidemic Influenza (James M. Anders Lecture XVI). (*Transactions & Studies*, February, 1941.)

*February 5*

MACKIE, THOMAS T. Studies in Ulcerative Colitis. (Mary Scott Newbold Lecture XLIX.) (*Transactions & Studies*, April, 1941.)

*March 5*

GOODPASTURE, ERNEST W. The Cell-Parasite Relationship in Bacterial and Virus Infection. (Alvarenga Prize Lecture I.) (*Transactions & Studies*, April, 1941.)

*April 2*

STREETER, GEORGE L. New Data on Embryogenesis in Monkey and Man. (Nathan Lewis Hatfield Lecture XXV.) (*Transactions & Studies*, June, 1941.)

*May 7*

VAUGHAN, HENRY F. The Way of Public Health. (James M. Anders Lecture XVII.) (*Transactions & Studies*, June, 1941.)

*October 1*

BITTNER, JOHN J. The Influence of Foster Nursing on Experimental Breast Cancer. (Alvarenga Prize Lecture II.) (*Transactions & Studies*, December, 1941.)

*November 5*

YOUMANS, JOHN B. Observations on Nutrition in France. (James M. Anders Lecture XVIII.) (*Transactions & Studies*, December, 1941.)

*November 30**

GILLESPIE, ROBERT DICK. Psychoneuroses in Peace and War. (S. Weir Mitchell Oration IX.)

*December 3*

PALMER, WALTER LINCOLN. The Role of Acid Gastric Juice in Gastric and Duodenal Ulceration. (Thomas Dent Mütter Lecture LIV.) (*Transactions & Studies*, February, 1942.)

LECTURES FOR THE GENERAL PUBLIC

*January 24*

OWEN, HUBLEY R. Activities of the Department of Public Health, with Plans for the Future.

*April 18*

KERN, RICHARD A. Allergy and You.

*November 21*

BEARDSLEY, E. J. G. Doctors, Drugs, and Other Healing Influences.

* Special meeting, sponsored jointly by the College and the Salmon Committee of the New York Academy of Medicine.

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** = Communication printed in full
* = Abstract
† = A reference to the list of officers and committees


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c.B.J.